Rochester Public Library

Pit and Quarry

With which is consolidated

CEMENT-MILL & QUARRY

November, 1932

The Election

This is the first time that we have essayed to comment on political affairs in this journal, but we believe that the upheaval indicated by the results of the balloting on November 8 is of unprecedented importance aside from any party considerations. Up to the moment that the polls were closed on that day Americans were divided as they had not been in many years and the partisanship that animated them was uncommon in intensity and in its causes. They had suffered, as few living Americans have suffered, from the pangs of self-denial and privation. Beyond the swelling oppressiveness of their novel condition they saw no quick relief, and the pressure of their discontent carried many of them into the depths of despair. People in all walks of life, regardless of party traditions and party affiliations—regardless, some will say, of reason and a consideration for their long-time good—attributed their trials more and more to political agencies. If it was logical to blame the party in power for a crisis that left few areas of the world untouched, it was equally logical to look to a different party for relief. The average man has little capacity for analyzing causes of rather obscure derivation, causes which baffled even the best minds among statesmen and economists. He was not to be blamed, therefore, if he voted as a regard for his economic self-interest seemed to dictate, and even if that vote, for whichever party it was cast, should in the long run prove to have been ineffective. The American people have voted as they never voted before and with a determination and a sincerity that no one will question.

These truths are evident to us all, now that the tension of recent months and the excitement of that single day are passed. We all see in the result, not so much an expression of confidence in the party out of power or of lack of faith in the party in power, as the release of energies long held in suspense, of discouragement slowly engendered, and of hopes slowly taking shape. Every thinking person sees, too, that the result gives cause for renewed faith, that the victory is not so much a triumph over partisan politics as it is a conquest of emotional unbalance. No nation can be sound when millions of its citizens are dependent or destitute, when discontent glowers from the faces of multitudes of suffering people, and when even the comfortable and well-fed voice continued and growing disappointment.

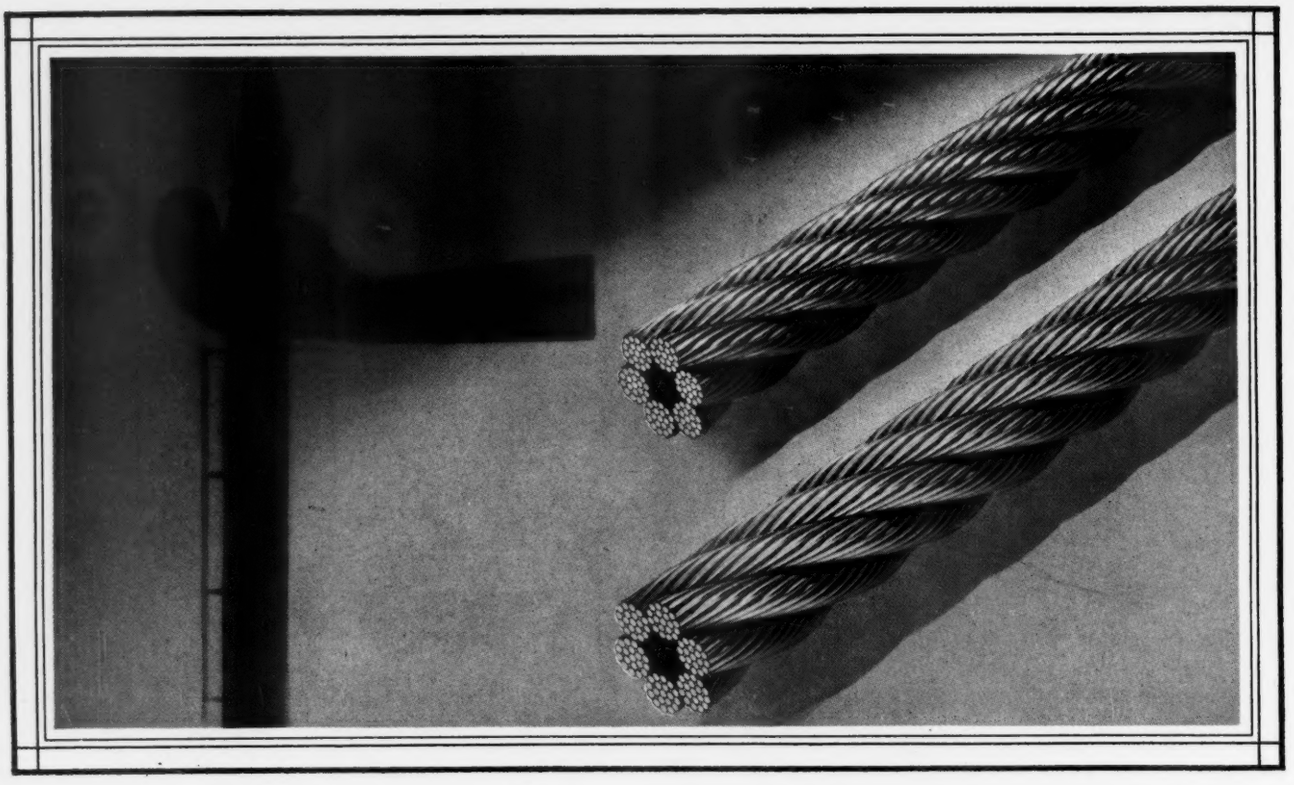
For three years men have waited for an improvement in their economic condition. Business men have hoped—many of them have even prayed—for deliverance from the sloth, the complacency, the seeming indifference that have stifled their ambition and slowed their hands. Relief was looked for even in some revolutionizing invention, so paralyzed was the public mind. Men almost awaited the coming of some miracle that would lift men's minds from despair and turn their faces once more toward the light.

And just there lies the great gain of the election. The outstanding fact is not the defeat of one party or the success of another. Such an explanation will not account for the millions of crossed ballots and temporary changes of allegiance from one party to another. The significant fact is the transference of millions of Americans from the slough of despond to the realm of confidence, the great upheaval that was needed to restore American faith and to head a drifting nation in the right direction.

The election is over. Millions who were discontented and discouraged are now satisfied and confident. The disappointed are now in the minority instead of in the majority, and their number and influence will decrease daily. That is the great accomplishment of November 8, that is the turning point for which a whole nation waited. Let us be thankful that the turn has come, that the doubts and misgivings of a great people have been scattered, and that a nation divided by parties is now united in its rediscovered spirit of courageous confidence. And, above all, let's get to work and make the promise a reality.

Pages 17-21

Since September 11, 1929, the largest net paid A. B. C. circulation in the field



A *Safeguard* for ROPE BUYERS

that assures maximum rope economy

In buying wire rope it is your aim to secure the rope which will give you safe service at lowest cost. It is Roebling's aim to aid you... and it is in an enviable position to do so.

In making recommendations our sole interest is to see that you get the rope that will best meet your needs. And we are fully free to give you absolutely unbiased advice... first, because of the completeness of the Roebling Line; secondly, because we are not prejudiced in favor of any one kind of rope.

Made in a great variety of types and designs, Roebling Ropes span *every* wire rope need. They include Standard Right, Left, Lang, Preformed and Alternate Lays, in all degrees of flexibility in both rope and strand constructions. In fact, there is no wire rope requirement that cannot be met by Roebling Rope with utmost service safety and at lowest operating cost.

These features of Roebling Advisory Service safeguard the rope buyer. They are his assurance of maximum rope economy with maximum rope safety.

JOHN A. ROEBLING'S SONS COMPANY, TRENTON, N. J.

Wire · Wire Rope · Copper & Insulated Wires & Cables · Welding Wire · Flat Wire · Wire Cloth & Wire Netting

Branches in Principal Cities — Export Dept.—New York, N.Y.

A plain statement about Wire Rope Economy

Roebling does not indulge in nor encourage sweeping claims of superior wire rope economy. Such claims, if generally made, would merely confuse the rope user. ¶ For the guidance of rope buyers, however, Roebling does assert that when gauged by the work performed, NO wire rope, regardless of make or construction, will show lower general average operating costs than Roebling.

Wire Rope for all purposes

The importance of selecting the right rope for each use cannot be too strongly emphasized. For no one rope will meet all requirements. ¶ Roebling makes wire rope of a great variety of types and designs, including Standard Right, Left, Lang, Preformed and Alternate Lays, in all degrees of rope and strand flexibility. ¶ The great stamina of all Roebling Ropes is primarily due to the quality of Roebling Wire. This Acid Steel Wire is renowned for its fatique resisting and wearing qualities. No better rope wire is produced. ¶ "BLUE CENTER" STEEL is the highest grade and is generally recommended for severe duty.

JOHN A. ROEBLING'S SONS COMPANY

Rochester Public Library
54 Court St.

This is what one Quarry Superintendent writes about N. Y. B. & P. Co. Products...

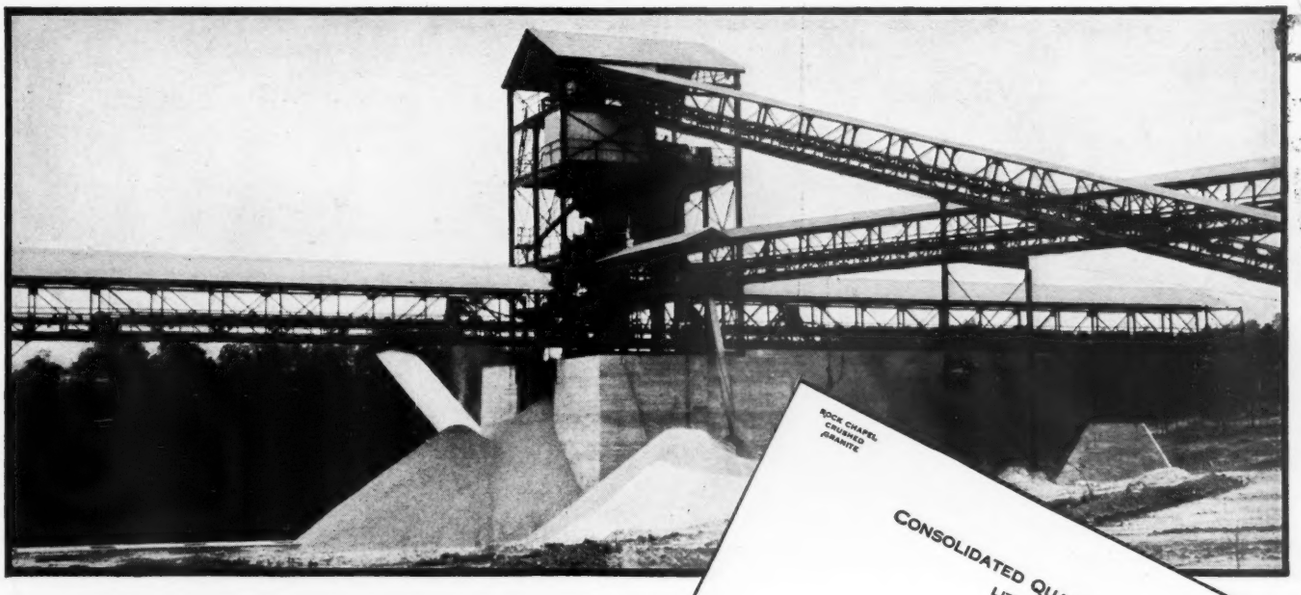
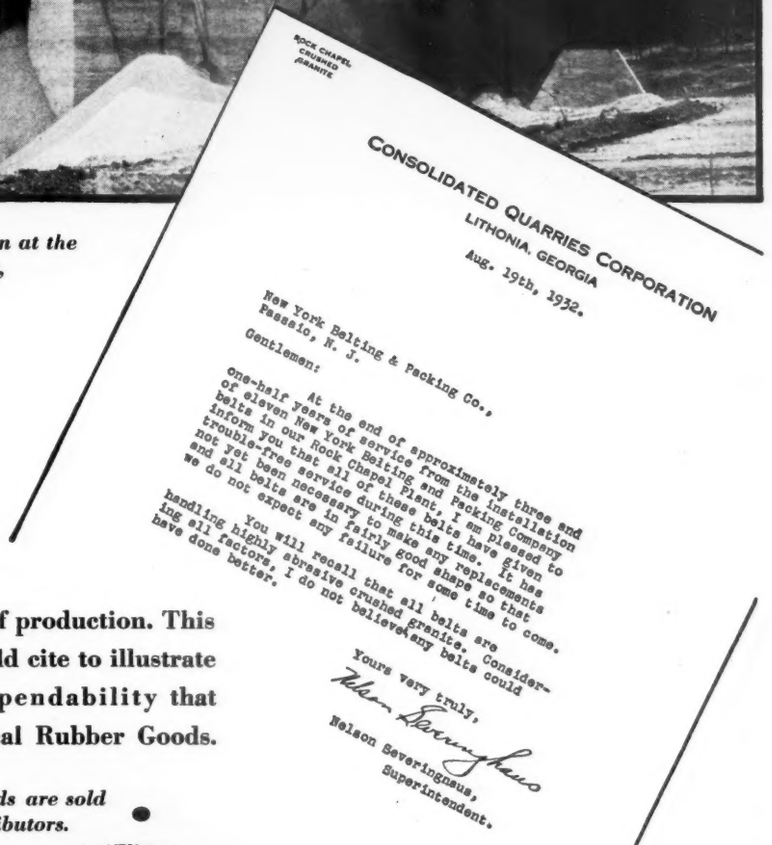


Illustration shows three giant conveyors in action at the Consolidated Quarries Corporation Plant, near Atlanta, Georgia.



ROCK CHAPEL CRUSHED GRANITE

CONSOLIDATED QUARRIES CORPORATION
LITHONIA, GEORGIA

Aug. 19th, 1932.

New York Belting & Packing Co.,
Passaic, N. J.

Gentlemen:

At the end of approximately three and one-half years of service from the installation of eleven New York Belting and Packing Company belts in our Rock Chapel Plant, I am pleased to inform you that all of these belts have given trouble-free service during this time. It has not yet been necessary to make any replacements and all belts are in fairly good shape so that we do not expect any failure for some time to come.

You will recall that all belts are handling highly abrasive crushed granite. Considering all factors, I do not believe any belts could have done better.

Yours very truly,
Nelson Severinghaus
Nelson Severinghaus,
Superintendent.

...MR. NELSON SEVERINGHAUS Superintendent Consolidated Quarries Corporation writes in his letter, reproduced for your perusal, a better advertisement than we could possibly phrase. His conveyors are called upon to maintain a most rigid and exacting schedule of production. This is but one of many examples which we could cite to illustrate the economy, efficiency and certain dependability that characterize all N. Y. B. & P. Mechanical Rubber Goods.

N. Y. B. & P. Mechanical Rubber Goods are sold exclusively through competent distributors.

NEW YORK BELTING & PACKING CO.

1790 BROADWAY — NEW YORK CITY

FOUNDED 1846 — NEW YORK BELTING & PACKING CO.

Pit and Quarry

With which is consolidated
CEMENT-MILL & QUARRY

Volume 25 November, 1932 Number 3

MEMBER AUDIT BUREAU OF CIRCULATIONS

Published on the first of each month for producers and manufacturers of Cement, Crushed Stone, Gypsum, Lime, Sand, Gravel and other non-metallic minerals. Entered as second-class matter October 9, 1928, at the Postoffice at Chicago, Ill., under the Act of March 3, 1879.

Copyright 1932 by
COMPLETE SERVICE PUBLISHING CO.
538 South Clark St.
Chicago, Ill.

H. W. BAUMGARTNER
President

S. A. PHILLIPS
Vice-President and Directing Editor

Assistant Editors:
W. E. TRAUFFER
HARRY F. UTLEY

Advertising Representatives:

Chicago
W. A. BUSCHMAN
Telephone *HARrison 9357*
Chicago, Ill.

New York
E. M. BUCK, 76-66 Austin St.
Telephone *Boulevard 8-5259*
Forest Hills, L. I., N. Y.
A. W. RANDLE, 5 Prospect Place
Telephone *Murray Hill 4-6700*
New York, N. Y.

Cleveland
W. E. COATES, 1258 Marlowe Ave.
Telephone *Lakewood 1166J*
Lakewood, Ohio

San Francisco
C. C. ECKART, 703 Market St.
Telephone *GArfield 4964*

Subscription price: $2 for 3 years, $1 for 1 year in the United States and possessions, Central, and South America; elsewhere (including Canada) $1 additional for each year. Single copies 20 cents.

In This Issue

News of the Industry 17

Editorials 22

Steel Company's Stone Quarry Furnishes Fluxing Material for Furnaces 24

"Semi-Portable" Unit Augments Facilities of Permanent-Plant Operator 29

Nonmetallics of Great Commercial Value Cover Much of Oklahoma's Area 32

Slag Plant Has Equipment for Readily Loading Any Desired Mix or Size 39

Theoretical and Practical Developments in Portland-Cement Chemistry—Part V 42

Portable Plants Big Competitive Weapon for Permanent-Plant Operators 47

Men of the Industry 49
Personal Mention 50
Coming Events 50
Traffic News and Comment 51
Recent Patents 54
Foreign Developments 55
Financial News 57
Cement Statistics 59
New Machinery and Supplies 61
Pumpings from the Old Pit 65
Manufacturers' Publications 65
Saving Through Safety 66

Next Issue December, 1932

THE PLUS THAT COMES WITH GOODYEARS

The fact that Goodyear Conveyor Belts carry more tons at lower belt cost is well and widely known in the rock products industry.

WHY they should unvaryingly deliver this more efficient, more economical performance may not be so well understood.

It is because there comes to every pit, quarry and mill with every Goodyear Belt — Conveyor or Transmission — something much more valuable, much more important, than so much rubber and so much duck, so many feet long, so many plies thick, so many inches wide.

There is a PLUS in Goodyear Belts over and above even the best of belting materials. It is the PLUS assured by Goodyear's scientific construction, based on years of experience in conveyor belt manufacturing, and the practical, expert analysis of the G.T.M.—Goodyear Technical Man.

Put the two together—the scientific knowledge of how to build a *balanced* belt, body and cover, and how to apply that belt *in the right place*—and you are bound to get Goodyear better, lower-cost performance.

Why not go over this matter of longer-lived, more trouble-free, lower-cost belting with the G.T.M.? A word to Goodyear, Akron, Ohio, or Los Angeles, California, or to the Goodyear Mechanical Goods Distributor nearest to you, will bring him to your plant.

All Goodyear products are constantly under development and test for further improvement. Each new advance is completely mill- or mine-proved when offered for industrial service.

BELTS
MOLDED GOODS
HOSE
PACKING

THE GREATEST NAME IN RUBBER

GOODYEAR

You'll Never Forget These Conventions

With Their "Triple-A" Exposition . . .*

THE distinctive economies resulting from holding Annual Conventions of the National Crushed Stone Association, the National Ready Mixed Concrete Association and the National Sand & Gravel Association, at the same time and place are of keen interest to everyone connected with the industries represented by these associations.

The value of attending an association convention and securing the benefits of its stimulating inspiration scarce needs repeating. Your past experience has demonstrated the advantages of owners, superintendents, operating men and salesmen getting together to learn the plans of their industry's leaders for solving pressing problems . . . to start the new year off with plenty of confidence and enthusiasm.

NOW—new and unusual advantages are offered your organization in the novel arrangement of holding concurrent but independent conventions in conjunction with a Joint Exposition, Jan. 16th to 18th, 1933, at the Book-Cadillac Hotel, Detroit.

First—there's the big economy secured by the lowest railroad rate in the history of any convention,—round-trip fares at one and one-ninth the cost of one-way fares! Thus every producer or sales executive may DOUBLE the attendance of his representatives, for practically the same cost of other years.

Special reduced rates for rooms and meals and the holding of a joint Smoker and joint Banquet, provide further savings.

Then, too, everything's so convenient. The main convention activities, registration booth, and exhibits are located on one floor, in one hotel. No chance of missing something that's going on. You'll eat, sleep and greet old friends, all under the one roof.

Also, the Joint Exposition will bring to you every new and improved type of equipment to increase economy and efficiency in the operation of your business.

A gigantic gathering of prominent figures in the construction industry will be in Detroit that week for the Highway & Building Congress. You'll want to be with these additional thousands whose industries and interests are so closely interwoven with your own.

Everyone interested or engaged in these industries is cordially invited to be present, whether Association members or not. Plan NOW to marshal your forces at Detroit for this great mobilization of all interests in the construction world.

You'll get a whale of a lot of benefit . . . lots of worries lifted off your mind . . . have the time of your life . . . but don't delay! Send in your reservation NOW.

▼ ▼ ▼

DETROIT, MICH.
January 16-18, 1933

* *"Triple-A"*
Meaning a combined Exposition of these three Associations:

NATIONAL CRUSHED STONE ASSOCIATION
NATIONAL READY MIXED CONCRETE ASSN.
NATIONAL SAND AND GRAVEL ASSOCIATION

Portable Crushing, Screening and Washing Plants *for Commercial Producers!*

If high freight rates and local competition on the job are making it impossible for you to compete successfully for sand and gravel business, *supplement your present plant* with WESTERN Portable Crushing, Screening and Washing Plants.

They have a capacity of 1000 cubic yards or more daily.

They produce a fine, accurately sized product.

They are ruggedly built for hard service and continuous operation.

They require a minimum of man power and show real profits on the investment.

WESTERN Portable Crushing and Screening Plants feature two crushers opposed to minimize vibration, self-aligning roller bearings on both crusher shafts, anti-friction bearings throughout, conveyors flashed their entire length, an overlapping type bucket elevator conveyor, a double deck gyrating screen, rigid or swivel type pit conveyor or shovel loading hopper.

WESTERN Portable Washing Plants feature a 4′ x 8′ triple deck gyrating screen, three screw type inclined washers, anti-friction bearings throughout, power plant and 6″ two stage centrifugal pump, and a three product or mixed delivery.

As the aeroplane and motor truck are today supplementary carriers of the railroads, so must portable crushing, screening and washing plants come to be supplementary equipment for the commercial sand and gravel producers.

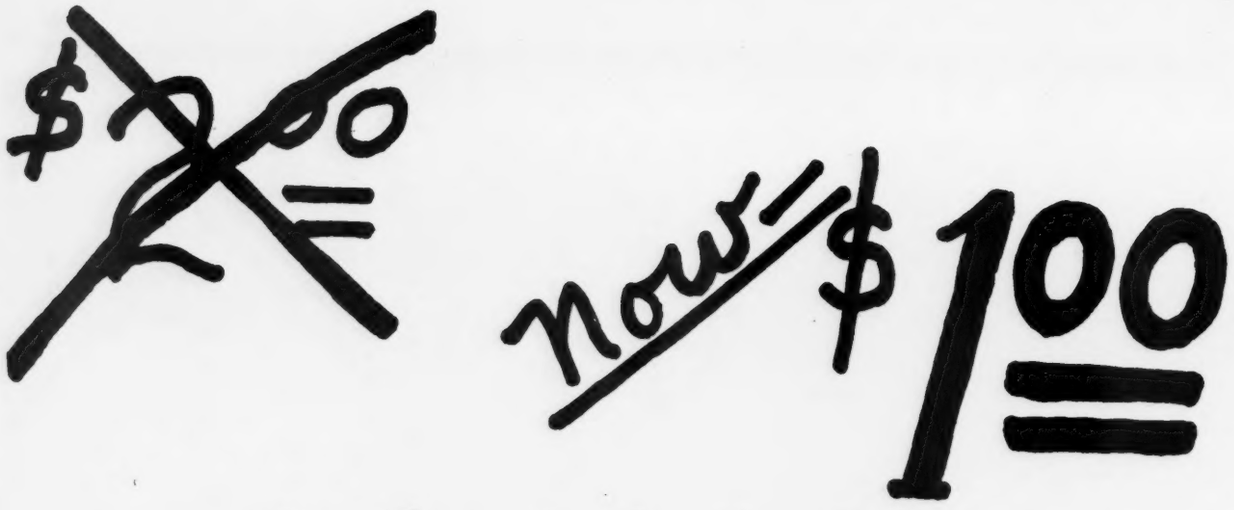
Investigate WESTERN Portable Crushing, Screening and Washing Plants!

The Austin-Western Road Machinery Co., 400 North Michigan Avenue, Chicago, Ill.

No. 349

The Austin-Western ROAD MACHINERY CO.

ROAD ROLLERS, CRUSHING & SCREENING PLANTS, SCARIFIERS, SWEEPERS & SPRINKLERS, ROAD GRADERS, ELEVATING GRADERS. MOTOR GRADERS, PLOWS & SCRAPERS, BITUMINOUS DISTRIBUTORS DRAGS, SHOVELS & CRANES, DUMP WAGONS, SNOW PLOWS.



A Break for the Operator

Pit and Quarry now costs only $1.00 per year. There's less mechanical cost in publishing a monthly paper, and money is saved. We're glad to pass these savings on to readers — they have been first considered.

x x x x

Editorially, Pit and Quarry will be even better, and will contain a greater number of pages per issue. Never before has such an array of articles been scheduled — and readers now get two issues in one — a value never before seen in the field and, at the same time, have more time between issues in which to read and study them.

x x x x

Pit and Quarry is the only monthly, and the only one-dollar publication in the field.

x x x x

Subscribe now — give the plan your support.

x x x x

PIT AND QUARRY PUBLICATIONS, 538 S. Clark St., Chicago

AMERCLAD
ALL-RUBBER
CABLES

Ready to "Rough It" For You

Greater tensile strength—elimination of kinking—that's what American Steel & Wire Company Amerclad All-Rubber Cables offer you in addition to greatly increased life due to high resistance to abrasions and to the action of acids, oils and greases.

Remember—for many uses in connection with the operation of electric shovels and locomotives—Amerclad. For loading machines and welding machines—Amerclad. For mining machines and drills—Amerclad.

Write us for samples of Amerclad All-Rubber Cables.

1831 MORE THAN 100 YEARS of PROGRESS IN WIRE MAKING 1932

AMERICAN STEEL & WIRE COMPANY

208 South LaSalle Street, Chicago
94 Grove Street, Worcester

SUBSIDIARY OF UNITED STATES STEEL CORPORATION
AND ALL PRINCIPAL CITIES

Empire State Bldg., New York
First National Bank Bldg., Baltimore

Pacific Coast Distributors: Columbia Steel Company, Russ Building, San Francisco
Export Distributors: United States Steel Products Company, New York

Classified Buyers' Guide

A Directory of PIT AND QUARRY Advertisers Arranged According to Product

Although every effort is made to insure accuracy and completeness in these listings, the publisher cannot accept responsibility for errors or omissions. Any mistakes discovered will gladly be rectified, if brought to the attention of the Advertisers' Service Department.

Index to Advertisers on Page 80

Agitators, Thickeners and Slurry Mixers
- Traylor Eng. & Mfg. Co.

Air Compressors
- Traylor Eng. & Mfg. Co.

Air Separators
- Bradley Pulverizer Co.
- Gay, Rubert M.
- Gruendler Crusher and Pulverizer Co.
- Universal Road Machinery Co.

Ash and Refuse-Handling Equipment
- Allen Sherman Hoff Co.
- Haiss Mfg. Co., Geo.

Asphalt, Cold Mix, Plants
- Simplicity System Co.

Babbitt Metal
- Ryerson and Son, Inc., Joseph T.

Backfillers
- Austin-Western Road Machinery Co.

Balls (Grinding)
- Kennedy-Van Saun Mfg. and Eng. Corp.

Balls (Tube-Mill, etc.)
- Kennedy-Van Saun Mfg. and Eng. Corp.

Belting
- Goodyear Tire and Rubber Co., Inc.
- Haiss Mfg. Co., Geo.
- New York Belting and Packing Co.
- Welch Engineering Service, F. M.

Bin Gates
- Allen Sherman Hoff Co
- Haiss Mfg. Co., Geo.
- Kennedy-Van Saun Mfg. and Eng. Corp.
- McLanahan and Stone Corp.
- Morrow Mfg. Co.
- Smith Engineering Works
- Traylor Eng. & Mfg. Co.

Bins (Cast Iron)
- Allen Sherman Hoff Co.

Bins (Steel)
- Austin-Western Road Machinery Co.
- Kennedy-Van Saun Mfg. and Eng. Corp.
- McLanahan and Stone Corp.

Blast-Hole Drills (See Drills—Blast-Hole)

Blasting Machines
- Hercules Powder Co.

Blasting Supplies
- Ensign-Bickford Co.
- Hercules Powder Co.

Blocks (Sheave)
- Sauerman Bros. Inc.

Borings, Core
- Pennsylvania Drilling Co.
- Sprague and Henwood Inc.

Braces (Track) (See Track Braces)

Bronze Work (Ornamental)
- National Wire Cloth Co.

Bucket Elevators (See Conveyors and Elevators)

Buckets (Clamshell, Orange-Peel, Etc.)
- Haiss Mfg. Co., Geo.

Buckets (Dragline Cableway)
- Sauerman Bros. Inc.

Buckets (Elevator and Conveyor)
- Cross Engineering Co.
- Haiss Mfg. Co., Geo.
- McLanahan and Stone Corp.
- Smith Engineering Works

Cableways
- American Steel & Wire Co.
- Leschen and Sons Rope Co., A.
- Roebling's Sons Co., John A.
- Sauerman Bros. Inc.

Caps (Blasting)
- Hercules Powder Co.

Capstans (See Winches and Capstans)

Carriers
- Smith Engineering Works
- Welch Engineering Service, F. M.

Car Rerailers (See Rerailers—Car)

Cars (Quarry and Gravel Pit)
- Austin-Western Road Machinery Co.

Car Wheels—(See Wheels—Car)

Castings
- Kennedy-Van Saun Mfg. and Eng. Corp.
- McLanahan and Stone Corp.

Cement Pumps (See Pumps; Air Pumps; Pumps, Cement Slurry; Pumps, Bulk Cement)

Chain (Elevating and Conveying)
- Cross Engineering Co.
- Haiss Mfg. Co., Geo.

Chutes and Chute Liners
- Cross Engineering Co.
- Goodyear Tire and Rubber Co., Inc.
- Haiss Mfg. Co., Geo.
- McLanahan and Stone Corp.
- Morrow Mfg. Co.
- New York Belting and Packing Co.

Clamshell Buckets (See Buckets—Clamshell, Orange-peel, etc.)

Clamshell Gates (See Gates-Clamshell)

Classifiers
- Allen Cone and Machy. Corp.
- Bradley Pulverizer Co.
- Kennedy-Van Saun Mfg. and Eng. Corp.
- Lewistown Foundry & Machine Co.

Clips (Wire Rope)
- American Steel & Wire Co.
- Leschen and Sons Rope Co., A.
- Roebling's Sons Co., John A.

Coal-Pulverizing Equipment
- Bradley Pulverizer Co.
- Gay, Rubert M.
- Kennedy-Van Saun Mfg. and Eng. Corp.
- Universal Road Machinery Co.

Compressors (See Air Compressors)

Concentrators (Slurry)
- Deister Concentrator Co.

Cones (Sand-Washing)
- Allen Cone and Machy. Corp.
- Smith Engineering Works

Conveyor Belting (See Belting)

Conveyors and Elevators
- Allen Sherman Hoff Co.
- Cross Engineering Co.
- Gruendler Crusher and Pulverizer Co.
- Haiss Mfg. Co., Geo.
- Kennedy-Van Saun Mfg. and Eng. Corp.
- Lewistown Foundry & Machinery Co.
- McLanahan and Stone Corp.
- Morrow Mfg. Co.
- Smith Engineering Works
- Traylor Eng. & Mfg. Co.
- Universal Road Machinery Co.
- Welch Engineering Service, F. M.

Coolers (See Kilns and Coolers—Rotary)

Cranes (Crawler and Locomotive)
- Austin-Western Road Machinery Co.

Crusher Parts
- Kennedy-Van Saun Mfg. and Eng. Corp.
- McLanahan and Stone Corp.

Crushers (Cone)
- Nordberg Mfg. Co.

Crushers (Hammer)
- Austin-Western Road Machinery Co.
- Gruendler Crusher and Pulverizer Co.
- Kennedy-Van Saun Mfg. and Eng. Corp.

Crushers (Jaw and Gyratory)
- Austin-Western Road Machinery Co.
- Gruendler Crusher and Pulverizer Co.
- Kennedy-Van Saun Mfg. and Eng. Corp.
- Lewistown Foundry & Machinery Co.
- Nordberg Mfg. Co.
- Smith Engineering Works
- Traylor Eng. & Mfg. Co.
- Universal Road Machy. Co.

Crushers (Roll)
- Austin-Western Road Machinery Co.
- Gruendler Crusher and Pulverizer Co.
- Kennedy-Van Saun Mfg. and Eng. Corp.
- McLanahan and Stone Corp.

Crushers (Rotary)
- Austin-Western Road Machinery Co.

Crushing Rolls
- Austin-Western Road Machinery Co.
- Kennedy-Van Saun Mfg. and Eng. Corp.
- McLanahan and Stone Corp.
- Traylor Eng. & Mfg. Co.

Detonators
- Hercules Powder Co.

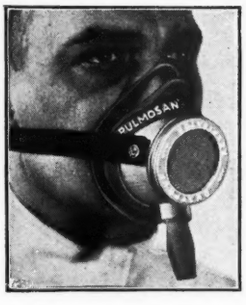
Diesel Engines (See Engines—Diesel)

Dragline Cableway Excavators
- Sauerman Bros. Inc.

Dragline Excavators
- Austin-Western Road Machinery Co.

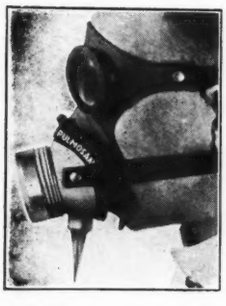
ASK THE MAN WHO WEARS ONE!

PULMOSAN RESPIRATORS



R-110
DUSTPRUF RESPIRATOR

Most popular for protection against fine dust and paint spray mist. Weight, 2½ oz. Comfortable, adjustable, easy breathing.



GR-230
GOGGLE RESPIRATOR

Provides protection of eyes, nose, throat and lungs, against dust, paint spray, fumes, smoke. One piece.

"If it's for Safety—
WE HAVE IT!"

TO get an authoritative opinion on the value of a machine or a tool, you go to the man in your plant who uses it.

Similarly, that's the surest way to find how efficient—safe—comfortable PULMOSAN RESPIRATORS are . . . *ask the man who wears one!*

You'll find that he has a feeling of security and safety. That he suffers no inconvenience by wearing one. That he wouldn't risk his health with any other device.

If you have no PULMOSAN RESPIRATORS in your plant . . . it might prove a revelation if you let a workman try a PULMOSAN recommended for his work.

We have confidence in this test. The majority of the largest corporations in the country are now using PULMOSAN RESPIRATORS because of such a test.

Most progressive firms are glad to adopt this better method, when shown. The coupon below gives you that opportunity. Fill it in and mail to

PULMOSAN SAFETY EQUIPMENT CORP.
176 Johnson St. Brooklyn, N. Y.

Mail this Coupon P&Q 11

Pulmosan Safety Equipment Corp.,
176 Johnson St., Brooklyn, N. Y.

Gentlemen: Send your recommendation and the price of a type for (state condition) .....

Send file of literature. ☐

Firm Name .....

Address .....

City ..... *State* .....

Individual .....

Classified Buyers' Guide

A Directory of PIT AND QUARRY Advertisers Arranged According to Product

Index to Advertisers on Page 80

Dredge Chain (See Chain)

Dredge Pipe (See Pipe)

Dredges
- Morris Machine Works
- Welch Engineering Service, F. M.

Drilling Accessories
- **Loomis Machine Co.**

Drilling Contractors
- **Pennsylvania Drilling Co.**
- Sprague and Henwood Inc.

Drills (Blast-Hole)
- **Loomis Machine Co.**

Drills, Diamond
- **Pennsylvania Drilling Co.**
- Sprague and Henwood Inc.

Drills (Rock)
- **Loomis Machine Co.**

Drills (Well) (See Drills—Blast-Hole)

Dryers
- Kennedy-Van Saun Mfg. and Eng. Corp.
- **Lewistown Fdry. & Mach. Co.**
- **McLanahan and Stone Corp.**
- **Traylor Eng. & Mfg. Co.**

Dust-Collecting Systems
- Allen Sherman Hoff Co.

Dust Handling Systems (Hydro Vacuum)
- Allen Sherman Hoff Co.

Dust Hoods and Helmets
- Pulmosan Safety Equipment Co.

Dynamite (See Explosives)

Elevator Belting (See Belting)

Elevators (See Conveyors and Elevators)

Eliminators (Soft Stone)
- Welch Engineering Service, F. M.

Engineers
- **Allen Cone and Machy. Corp.**
- **Cross Engineering Co.**
- Kennedy-Van Saun Mfg. and Eng. Corp.
- **McLanahan and Stone Corp.**
- Welch Engineering Service, F. M.

Engines (Diesel)
- Nordberg Mfg. Co.

Engines (Internal-Combustion)
- Nordberg Mfg. Co.

Engines (Steam)
- **Morris Machine Works**
- Nordberg Mfg. Co.

Excavating Machinery (See Shovels; Cranes; Buckets; etc.)

Excavators—Shallow Grading (Bucket Elevator Type)
- Haiss Mfg. Co., Geo.

Explosives
- Hercules Powder Co.

Fans (Exhaust)
- Kennedy-Van Saun Mfg. and Eng. Corp.

Feeders
- Kennedy-Van Saun Mfg. and Eng. Corp.
- **Morrow Mfg. Co.**
- **Smith Engineering Works**

Floor Sweeping Systems (Hydro Vacuum)
- Allen Sherman Hoff Co.

Fuses (Detonating)
- Hercules Powder Co.
- **Ensign-Bickford Co.**

Gaskets
- Goodyear Tire and Rubber Co., Inc.
- New York Belting and Packing Co.

Gasoline Engines (See Engines—Internal-Combustion)

Gates (Bin) (See Bin Gates)

Gates (Clamshell)
- Haiss Mfg. Co., Geo.

Gears and Pinions
- Haiss Mfg. Co., Geo.

Gelatin (See Explosives)

Generators (See Motors and Generators)

Glass Sand Equipment
- **Lewistown Foundry & Machine Co.**

Goggles
- Pulmosan Safety Equipment Co.

Grab Buckets (See Buckets—Clamshell, Orange-Peel, etc.)

Grinding Balls (See Balls, Grinding)

Grizzlies
- Kennedy-Van Saun Mfg. and Eng. Corp.
- **Lewistown Fdy. & Mach. Co.**
- **Smith Engineering Works**
- **Traylor Eng. & Mfg. Co.**
- **Universal Road Machy. Co.**

Guards (Wire)
- National Wire Cloth Co.

Guns (Hydraulic)
- **Georgia Iron Works**

Hammer Mills (See Crushers—Hammer)

Hoists
- **McLanahan and Stone Corp.**
- Sauerman Bros. Inc.
- **Smith Engineering Works**

Hose (Air, Steam and Water)
- Goodyear Tire and Rubber Co., Inc.
- New York Belting and Packing Co.

Hose Couplings (See Couplings)

Hydraulic Guns (See Guns—Hydraulic)

Idlers
- Smith Engineering Works

Jacks (Pulling)
- Edelblute Co., T. H.

Kilns and Coolers (Rotary)
- Kennedy-Van Saun Mfg. and Eng. Corp.
- **Traylor Eng. & Mfg. Co.**

Lime Kilns
- Kennedy-Van Saun Mfg. and Eng. Corp.

Linings (Ball- and Tube-Mill) (See Mill Liners and Linings)

Loaders and Unloaders
- Haiss Mfg. Co., Geo.

Mill Liners and Linings
- Kennedy-Van Saun Mfg. and Eng. Corp.
- New York Belting and Packing Co.

Mills (Grinding) (See also Crushers—Hammer)
- **Allen Cone and Machy. Corp.**
- Bradley Pulverizer Co.
- Kennedy-Van Saun Mfg. and Eng. Corp.
- **Lewistown Fdy. & Mach. Co.**
- **Traylor Eng. & Mfg. Co.**

Motors (Internal-Combustion) (See Engines—Internal-Combustion)

Nails
- American Steel & Wire Co.

Nozzles (Hydraulic) (See Guns—Hydraulic)

Ore Separators
- **Allen Cone and Machy. Corp.**

Oxygen (Liquid) (See Liquid Oxygen)

Packing
- Goodyear Tire and Rubber Co. Inc.
- New York Belting and Packing Co.

Partitions (Wire)
- National Wire Cloth Co.

Perforated Metal Plates
- **Chicago Perforating Co.**
- **Cross Engineering Co.**
- **Morrow Mfg. Co.**

Pipe Flanges
- **Georgia Iron Works**

Plug Valves (See Valves)

Pneumatic Drills (See Drills, Rock)

Portable Conveyors
- Haiss Mfg. Co., Geo.

Portable Crushing and Screening Plants
- Austin-Western Road Machinery Co.

Portable Engines (See Engines—Internal Combustion)

Portable Loaders (See Loaders and Unloaders)

Power Cables (Rubber Clad)
- American Steel & Wire Co.

Power Shovels (See Shovels, Electric, Internal-Combustion and Steam)

Pulverized Fuel Systems
- Gay, Rubert M.
- Kennedy-Van Saun Mfg. and Eng. Corp.
- Universal Road Machinery Co.

Pulverizers (See also Crushers; Mills; etc.)
- Austin-Western Road Machinery Co.
- Bradley Pulverizer Co.
- Gruendler Crusher and Pulverizer Co.
- Kennedy-Van Saun Mfg. and Eng. Corp.
- **Lewistown Foundry & Machinery Co.**

Pump Valves (See Valves, Pump)

Pumps (Cement Slurry)
- Allen Sherman Hoff Co.
- Morris Machine Works

You Don't

take chances when purchasing *wire rope*

if you buy

Williamsport

because

THE scientific engineering accomplishments of the past years have been marked by outstanding progress and betterments that have more than met the demand of equipment manufacturers and users for greater and more uniform strength and quality.

To this we have added perfection in workmanship and protection against substitution through the Telfax System of identification of grade, an exclusive patent of Williamsport.

In buying Williamsport you may do so with the assurance that no other make of wire rope will give better service at ANY price and it is easy to get wire rope of inferior grade. There's no use in paying more than Williamsport asks for Wire Rope. Let us tell you more about it—Write today.

Williamsport

WIRE ROPE COMPANY

Main Office and Works:
WILLIAMSPORT
PENNA.

General Sales Offices:
122 So. Michigan Ave.
CHICAGO

Classified Buyers' Guide

A Directory of PIT AND QUARRY Advertisers Arranged According to Product

Index to Advertisers on Page 80

Pumps (Centrifugal)

Allen Cone and Machy. Corp.
Allen Sherman Hoff Co.
Georgia Iron Works
Morris Machine Works

Pumps (Dredging)

Allen Sherman Hoff Co.
Georgia Iron Works
Morris Machine Works

Pumps (Sand and Gravel)

Allen Cone and Machy. Corp.
Allen Sherman Hoff Co.
Georgia Iron Works
Morris Machine Works

Purifiers, Steam (See Steam Purifiers)

Rerailers (Car)

Edelblute Co., T. H.

Respirators

Pulmosan Safety Equipment Co.

Rock Drills (See Drills—Rock)

Rod Mills

Kennedy-Van Saun Mfg. and Eng. Corp.
Traylor Eng. & Mfg. Co.

Roofing and Siding

Ryerson and Son, Inc., Joseph T.

Rope (Wire) (See Wire Rope)

Rubbish Burners

Cross Engineering Co.

Safety Equipment

Pulmosan Safety Equipment Co.

Sand Separators

Allen Cone and Machy. Corp.
McLanahan and Stone Corp.
Smith Engineering Works

Sand-Settling Tanks

Allen Cone and Machy. Corp.
Smith Engineering Works
Welch Engineering Service, F. M.

Scrapers (Power Drag)

Austin-Western Road Machinery Co.
Sauerman Bros. Inc.

Screens

Allen Cone and Machy. Corp.
Chicago Perforating Co.
Cross Engineering Co.
Deister Concentrator Co.
Deister Machine Co.
Gay, Rubert M.
Gruendler Crusher and Pulverizer Co.
Haiss Mfg. Co., Geo.
Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
McLanahan and Stone Corp.
Morrow Mfg. Co.
National Wire Cloth Co.
Roebling's Sons Co., John A.
Smith Engineering Works
Traylor Eng. & Mfg. Co.
Universal Road Machinery Co.
Welch Engineering Service, F. M.

Screens (Vibrating or Shaking)

Allen Cone and Machy. Corp.
Austin-Western Road Machinery Co.
Deister Concentrator Co.
Deister Machine Co.
Gay, Rubert M.
Gruendler Crusher and Pulverizer Co.
Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
McLanahan and Stone Corp.
Universal Road Machinery Co.

Separators (Air) (See Air Separators)

Sheaves

Gruendler Crusher and Pulverizer Co.
Haiss Mfg. Co., Geo.
McLanahan and Stone Corp.

Shovels (Electric, Internal Combustion and Steam)

Austin-Western Road Machinery Co.

Skip Hoists and Skips

Welch Engineering Service, F. M.

Spouts (See Chutes and Chute Liners)

Stackers

Welch Engineering Service, F. M.

Steel (Bars, Shapes, Plates, etc.)

Ryerson and Son, Inc., Joseph T.

Steel Grating (See Grating, Steel)

Steel Inclines (See Inclines, Steel)

Storage Equipment

Haiss Mfg. Co., Geo.
Sauerman Bros. Inc.

Sweeping Systems

Allen Sherman Hoff Co.

Tanks (Sand-Settling)

Allen Cone and Machy. Corp.
Morrow Mfg. Co.
Smith Engineering Works
Welch Engineering Service, F. M.

Tools (Drill) (See Drilling Accessories)

Track Braces

Edelblute Co., T. H.

Track Shifters

Nordberg Mfg. Co.

Tramways (Aerial)

American Steel & Wire Co.
Roebling's Sons Co., John A.

Transmission Belting (See Belting)

Transmission Machinery

Gruendler Crusher and Pulverizer Co.

Truck Cranes (See Cranes)

Tube-Mill Liners (See Mill Liners and Linings)

Tube Mills (See Mills—Ball, Tube, etc.)

Vibrating Screen Plate

Chicago Perforating Co.
Cross Engineering Co.
Morrow Mfg. Co.

Vibrating Screens (See Screens—Vibrating)

Washers (Sand, Gravel, and Stone)

Allen Cone and Machy Corp.
Haiss Mfg Co., Geo.
Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
McLanahan and Stone Corp.
Smith Engineering Works
Traylor Eng. & Mfg. Co.
Universal Road Machinery Co.
Welch Engineering Service, F. M.

Welding Supplies

American Steel & Wire Co.
Roebling's Sons Co., John A.

Well Drills (See Drills—Well)

Wire and Cable (Electric)

American Steel & Wire Co.
Roebling's Sons Co., John A.

Wire Cloth

National Wire Cloth Co.
Roebling's Sons Co., John A.

Wire Rope

American Steel & Wire Co.
Leschen and Sons Rope Co., A.
Roebling's Sons Co., John A.
Williamsport Wire Rope Co.

Wire-Rope Fittings

American Steel & Wire Co.
Leschen and Sons Rope Co., A.
Roebling's Sons Co., John A.
Williamsport Wire Rope Co.

Wire Rope Slings

American Steel & Wire Co.
Leschen and Sons Rope Co., A.
Roebling's Sons Co., John A.
Williamsport Wire Rope Co.

Wire (Welding)

American Steel & Wire Co.
Roebling's Sons Co., John A.

Worm Gears (See Gears and Pinions)

Modernize That Old Plant
—Changing Conditions Demand It

A PROBLEM confronting some of the older crushing plants is that of producing finer crushed materials at lower cost. This was true of the West Roxbury Trap Rock Company of West Roxbury, Mass., an old producer in that locality. The problem was met by modernizing with modern equipment. Among the new machinery installed was a 5½ foot Symons Cone Crusher in 1929; then in 1930 when a demand arose for "pea" sizes, a 3 foot Cone was added.

Other prominent producers, too, know the advantages found only in the Symons Cone. For delivery of a uniformly fine product in big capacity, they have no equal. Why take a chance of disappointment by trying to revamp your old crushing equipment? Install a modern Symons Cone Crusher and get modern performance from your plant.

Other Nordberg Products

Diesel Engines—Steam Engines

Air and Gas Compressors

Mine Hoists—Underground Shovels

Railway Track Maintenance Machinery

Special Machinery

NORDBERG MFG. CO., MILWAUKEE, WISCONSIN

New York City	London, England	Los Angeles
60 East 42nd Street	Bush House	Subway Terminal Building

SYMONS CONE CRUSHERS

ANNOUNCEMENT

OF VITAL IMPORTANCE TO ALL EQUIPMENT MANUFACTURERS

JOINT EXPOSITION

MANUFACTURERS DIVISIONS OF

NATIONAL CRUSHED STONE ASSOCIATION
NATIONAL READY MIXED CONCRETE ASSN.
NATIONAL SAND & GRAVEL ASSOCIATION

THIS idea of a Joint Exposition has more than mere novelty to commend it to exhibitors. For the first time a combined exhibit will be staged during the Annual Conventions of these three National Associations which will be held independently but simultaneously in the Book-Cadillac at Detroit, Jan. 16th to 18th, 1933.

These concurrent meetings—all held in the same hotel with the Exposition—will not only make it most convenient but unusually economical for manufacturers of machinery and equipment used in all three closely related industries.

Instead of contacting leading producers in these fields at separate expositions as in the past, the holding of one exposition . . . in the same hotel . . . in the same city . . . the same week . . . will greatly decrease exhibiting costs.

Consider how this arrangement will reduce your expenses for transporting equipment and representatives, hotel bills, and the time required of your sales organization for exhibit activities.

In addition to showing your products with greater economy and convenience to those connected with the production, distribution, and consumption of crushed stone, sand and gravel and ready mixed concrete, your exhibit will be visited by men of national and international importance who will attend the Highway and Building Congress at the Book-Cadillac that week.

This Congress will bring about the first real mobilization of members of related organizations of the construction industry. Its large scope and breadth is indicated by the importance attached to it by more than 20 organizations that will participate with annual meetings and conventions.

Present your products at the Decisive Moment when this Nationwide buying power will be exceptionally responsive to your exhibit. Insure the certainty of a prominent showing of your products at this unusual JOINT EXPOSITION by making your reservation for space NOW.

BOOK-CADILLAC HOTEL
DETROIT, MICH.

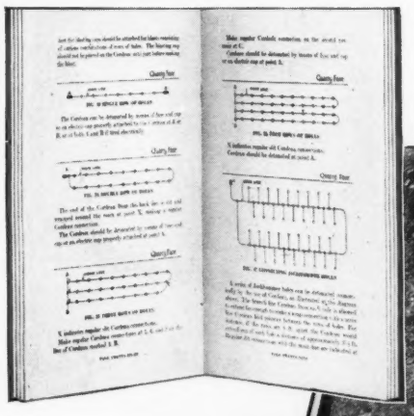
JANUARY 16-18, 1933

16th Annual Convention of National Crushed Stone Association; 3rd Annual Convention of National Ready Mixed Concrete Association; 17th Annual Convention of National Sand and Gravel Association; held concurrently and with Joint Exposition.

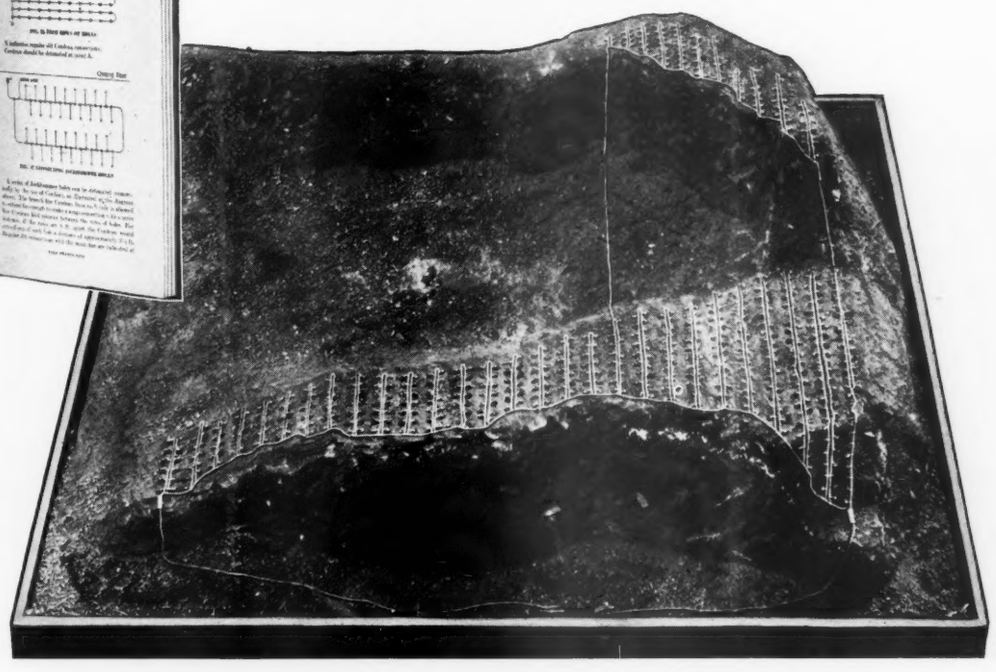
ADDRESS

JOINT EXPOSITION

ROOM 951 MUNSEY BUILDING
WASHINGTON, D. C.



Have you read the new Cordeau-Bickford hand book? A complete but understandable treatise on modern blasting with detonating fuse. **Free**—ask your powder company, or us, for a copy.



Complete detonation

means better fragmentation

It has been proved repeatedly that a charge exerts its greatest force at the point at which it was detonated. When the detonating agent extends *throughout* the charge, as is the case when Cordeau-Bickford Detonating Fuse is used, the *entire* charge has this increased efficiency because it is detonated at all points practically simultaneously. You thus obtain more work from your explosives when you use Cordeau.

Furthermore, the use of Cordeau simplifies loading, decreases loading time and lowers hazard. It enables operators to place their charges always to the best advantage, as in deck loads, without involved detail. It has made the giant blast practicable and profitable through planned hook-ups over extended areas, operating to permit successive relief of burden and produce better fragmentation.

THE ENSIGN-BICKFORD COMPANY • SIMSBURY CONN.

CORDEAU DETONATING FUSE BICKFORD

Turn Back This Season And See What You Might Have Made

When you close your books for the season, total your pumping power costs and divide by three. This will give you an idea as to the amount of money saved by plants your size, who used the Hydroseal Pump this year. Or if you are interested in output, take your annual production and increase it by 50%. Figure what this would have meant in money, and you will have an approximate idea as to how much more other concerns, using no more power than you, made this year by using a Hydroseal Pump. If you will write us how much you spent for pumping power this season, or your total production, we will send you the name of the nearest Hydroseal Pump installation in a plant that operated about as you did. The Allen-Sherman-Hoff Co., 215 South 15th Street, Philadelphia. Offices in Principal Cities.

HYDRO SEAL

VOLUME 25 NUMBER 3

Pit and Quarry

With which is consolidated

CEMENT-MILL & QUARRY

CHICAGO, NOVEMBER, 1932

More Organizations Invited to Congress

22 NOW READY TO PARTICIPATE

Support from industrial and business organizations for the Highway and Building Congress, to be held Jan. 16 to 20 at Detroit, Mich., is increasing steadily and 22 national associations and societies are now definitely enlisted to hold meetings during the congress, according to Fred Wardell, president of the Greater Detroit Committee. The movement to hold the huge gathering began several months ago, when 10 organizations agreed to coöperate in the important undertaking. More than 40,000 visitors are expected to attend.

By the time the gathering convenes, it is believed that more than 30 associations will have agreed to take part in the events of the week. J. Lee Barrett, vice-president of the Detroit Tourist and Convention Bureau, has issued invitations to many more organizations urging them to take part. These include: Contracting Plasterers' International Assn.; Roofing and Sheet Metal Contractors of America; International Cut Stone Contractors' and Quarrymen's Assn.; American Institute of Steel Construction; American Face Brick Assn.; National Cinder Concrete Products Assn.; American Concrete Institute; American Society for Municipal Improvements; Roofing and Sheet Metal Industries Conference; Sand Lime Brick Assn.; National Assn. of Marble Dealers; Common Brick Manufacturers' Assn.; American Institute of Architects; National Builders' Supply Assn.; American Oil Burner Assn.; American Society for Testing Materials; American Society of Heating and Ventilating Engineers; National Committee of Building Congresses; and the Electrical Guild of America.

Adds Air Separator to Lime-Plant Equipment

★ The United States Lime Products Corp., with general offices now located at 85 Second St. in San Francisco and maintaining an office in southern California at 1840 E. 25th St., Los Angeles, has installed a Raymond separator in its Sloan, Nev., plant. It has also made important additions to its already diversified line of products.

Much research has resulted in the manufacture of Arrowhead plastic pulverized quicklime which is a specially processed product finely pulverized and air-separated for use in the construction industry. Of equal if not of more importance is the introduction of Arrowhead lime plaster which is a prepared plaster containing the now famous Boulder Canyon dolomitic hydrated lime to which have been added fiber and an accelerator in the proper proportions to make a strong quick-setting lime plaster. These products have been introduced to the trade through the usual channels of retail building material dealers.

Frisco Bridge Brings Sand and Gravel Plant

★ The California Rock & Gravel Co. is making arrangements for the construction of a new sand-and-gravel plant at Eliot, near Livermore, Cal., in the Arroyo del Valle. Construction of the plant is to begin as soon as permission is secured from the board of supervisors to lay a spur track across the Pleasanton-Livermore highway. The plant is being built primarily to supply aggregates for the bridge which is to be built across San Francisco Bay between San Francisco and Oakland. The officers of the company are: F. N. Woods, Jr., president, and F. W. Erlin, vice-president and general manager.

Three Maryland Granite Quarries Unite Forces

The Construction Materials Co., a consolidation of three Maryland quarries, the Port Deposit Granite Co. and the Woodstock Quarries at Granite and the Thomas P. Murray quarries at Loch Raven, has recently filed papers of incorporation in Maryland. The new corporation will start business with a capital of $350,000, with all the stock subscribed. At present the headquarters are in Port Deposit but they will later be removed to Baltimore. Thomas P. Murray is president; Harry R. Williams, vice-president, and J. Wesley McAllister, secretary and treasurer.

Riparian Rights of Owners Are Upheld

BLOW TO DREDGING CONCERNS

The Michigan Dept. of Conservation has no authority to grant leases permitting the removal of sand and gravel from the Great Lakes by dredging concerns, according to a recent ruling by the Michigan Supreme Court, sitting at Lansing, Mich. The court ruled that it is entirely a question of riparian rights and that permission must be obtained by dredging companies from the owners whose lands abut on the lake frontage.

The Soo Sand & Gravel Co., Sault Ste. Marie, Mich., owner of shore properties, brought suit against the Sullivan Dredging Co. to recover the value of the material removed by the latter. A lower court held that the defendant was within its rights, inasmuch as it had operating leases issued by the state department of conservation. This decision was reversed by the supreme court.

Many Michigan producers will be affected by the ruling, since Lake Michigan, Lake Superior and Lake Huron, all bordering the state, are important sources of sand and gravel.

Indiana Limestone Deal Puts 780 Men at Work

A. E. Dickinson, president of the Indiana Limestone Co., recently announced that his company had been awarded the contract to supply stone for the new United States Dept. of Labor and Interstate Commerce Commission Bldg. at Washington. As a result 780 men were put back to work at once to supply the 1,555 carloads of stone which must be shipped at the rate of 220 carloads a month under the contract.

Jahncke Buys Washer to Clean River Gravel

★ Jahncke Service, Inc., New Orleans, La., recently purchased an Eagle twin-screw gravel washer, which has 18-in.-diameter flights and a capacity of 120 tons per hr. This washer is to be used to remove lignite, vegetable matter, sticks, bark, etc., from gravel to be dredged from the river for government work.

Cement From Britain Worries Americans

UNDERSELLS DOMESTIC PRODUCT

More evidence of dumping and of the serious effects on American industries of low-priced foreign products was presented recently before the commissioner of customs in Washington, D. C. Witnesses presented data with respect to importations of cement from Great Britain. Albert M. Barnes of New York, attorney for the domestic producers, indicated that their complaint was not so much with relation to the amount of the importations as to the low price for which the cement is sold. Mr. Barnes said that British cement sells in New York City for $1.35 per bbl. as compared to $1.54 for the domestic product. He said that cement is selling in London for 40 c. per bbl., whereas the pay-roll alone for domestic cement amounts to 37 c. per bbl. The commissioner is asked to invoke the anti-dumping law and issue an order of suspicion of dumping, thus requiring importers to put up bonds.

California Quarry Puts in New Type of Crusher

★ Aggregates Crushing Equipment, San Francisco, Cal., recently installed an Ace crusher in the Skyline Quarry on Skyline Blvd. south of the city. Rock is being crushed for the state highway department. A description of this crusher was published in the May 18, 1932 issue of PIT AND QUARRY. A full report of the results of tests being made on this crusher will be published in a later issue.

May Shift Highway to Enlarge Marl Deposit

Forty additional acres of marl will be made available to the Fenton, Mich., plant of the Aetna Portland Cement Co., if plans for rerouting a highway which now crosses the deposit are carried through. Livingston County engineers are making a survey to collect data for presentation to the circuit court seeking to condemn the present right-of-way of the road in favor of the cement company. If the court approves the proposal, the new road will loop around the southern extremity of the marl deposit. E. M. Bunce is general superintendent of the plant.

Sharp Rise in Canada's August Asbestos Output

Canadian asbestos production in August totaled 9,918 tons, against 7,164 in July and 13,211 in August, 1931. August exports were 8,617 tons, against 6,714 in July. Imports of asbestos products in August were valued at $36,521, a decline of 23.1 per cent. from July.

Quotations for magnesia and compressed sheet fibers advanced $5 a ton in August. Other prices were unchanged.

Only six tons of crude No. 1 and 12 tons of crude No. 2 was produced in August, the bulk of production and sales continuing to be in waste and in cheaper grades.

For the first eight months of 1932 asbestos production totaled 72,539 tons, against 106,755 in the like 1931 period.

Scrubber, Screens and Sand-Drag for Hersey

★ Among the equipment being furnished by the F. M. Welch Engineering Service for the new plant of the Hersey Gravel Co., at Hersey, Mich., is a 72-in. by 28-ft. Allswede scrubber, a 5-ft. by 5-ft. by 32-ft. sand-drag, three vibrating screens and other machinery.

Martinsburg Lime Plant Bought by Ray Layman

The Martinsburg Lime & Stone Co., Martinsburg, Pa., was recently sold by Charles Baughman to W. Ray Layman of that city. The history of this company dates back thirty or more years, during which period it has changed hands a number of times. The capacity of the plant is about 100 tons of crushed stone and 100 bu. of lime per day.

New York Quarry Buys Crushers and Screen

★ The Greene County Crushed Stone Co., Cairo, N. Y., recently installed an 18-in. by 32-in. cast-steel frame primary jaw crusher, a 10-in. by 20-in. secondary crusher, a bucket-elevator and a 48-in. revolving screen all furnished by the Acme Road Machinery Co. The material produced is being used for highway construction.

Nebraska Court Calls Lyman-Richey Monopoly

A constant decree has been entered in the Supreme Court of Nebraska, sustaining the claim of the state's attorney general that the Lyman-Richey Sand & Gravel Co. of Omaha, which has been in control of 90 per cent. of the sand-and-gravel business in the state, is a monopoly. The court has ordered that it terminate all leases and agreements that have clauses which are restrictive in character and intended to limit or suppress competition and to divest itself within six months of interests in competing companies.

News Briefs

The Oregon Portland Cement Co. plant at Oswego, Ore., went into operation on Oct. 1 after having been shut down since January. Work is in sight for four or five months due to a general pick-up in business and state-highway work aided by Reconstruction Finance Corp. funds. According to L. C. Newlands, president of the company, 115 men were put to work in three shifts. Mr. Newlands plans to organize four 6-hr. shifts in order to give employment to more men.

* * *

Operations were recently resumed at the plant of the Alpha Portland Cement Co., Manheim, W. Va.

* * *

The Clear Lake Sand & Gravel Co., Clear Lake, Ia., has started operations on a 14-hr.-day basis with 22 men on the pay-roll, the step-up in operations being made necessary through heavy fall orders. Contracts to be filled within a short period of time on two projects will aggregate in excess of 900 carloads with every indication that work will continue.

* * *

C. S. Cary & Son are reported to have started operations at a gravel pit near Sparta, Ga., the material to be used for road work.

* * *

The Fenton, Mich., plant of the Aetna Portland Cement Co. resumed operation recently with a full operating force of 85 men. No statement was made as to the length of time the plant will operate.

* * *

The Arkansas Portland Cement Co., at Okay, near Nashville, Ark., has resumed operations of plant, and is reported working at capacity.

* * *

The plant of the Riverside Cement Co., at Oro Grande, Cal., was recently reopened after having been shut down for nearly three years. Shipments of cement are being made to Hoover Dam.

* * *

The plant of the Southwestern Portland Cement Co., in El Paso, Tex., began operations again Oct. 20, after a shut-down since July 15.

* * *

The Lehigh Portland Cement Co. has resumed operations at its Birmingham, Ala., plant and expects to reopen its Oglesby, Ill., plant this month.

* * *

The plant of the Superior Portland Cement Co. at Concrete, Wash., is again in full operation after having been closed for about two months. Work is expected to continue for at least six weeks with the orders at present in sight.

Highway and Building Congress Notes

The Manufacturers' Divisions of the National Crushed Stone, and National Ready Mixed Concrete, and the National Sand and Gravel Associations recently announced the members of the joint committee to be in charge of the joint exposition of machinery to be held in conjunction with the joint conventions of these associations at the Book-Cadillac Hotel, Detroit, Mich., January 16 to 18, 1933.

The members of this committee are: C. H. Adamson, Stephens-Adamson Mfg. Co.; Lucius Beebe, Troco Lubricating Co.; M. B. Garber, Thew Shovel Co.; A. Goldberg, Allis-Chalmers Mfg. Co.; D. D. Guilfoil, Sauerman Bros., Inc.; C. S. Huntington, Link-Belt Co.; M. S. Lambert, Robins Conveying Belt Co.; W. H. Potter, Manganese Steel Forge Co.; S. R. Russell, E. I. Dupont de Nemours & Co.; B. G. Shotton, Hendrick Mfg. Co.; and L. W. Shugg, General Electric Co.

New Marble Mill Takes Place of Burned Plant

★ The Lee Marble Co., Lee, Mass., is building a new marble mill to replace an old an old one which had been destroyed by fire together with all its equipment. The main building will be about 200 ft. long by 100 ft. wide and will be of fireproof construction with steel frame, concrete foundations, etc. Leo F. Caproni & Co., are consulting engineers for the design and construction. This firm last year designed and built a new granite cutting shed for H. E. Fletcher & Co. at West Chelmsford, Mass., and are now preparing plans for doubling the capacity of this mill.

One-Third of America's Fluorspar from Illinois

A mineral industrial conference was held on Oct. 20 at Rosiclare, Ill. This conference, which is the fourth to be held this year, was held under the auspices of the Illinois Chamber of Commerce and the Illinois State Geological Survey in an effort to stimulate the development of the state's mineral wealth. About 150 representative business men of southern Illinois attended the conference and were addressed by a number of speakers, among them M. M. Leighton, chief of the Illinois Geological Survey. It was brought out that Hardin County, Ill., alone produces 61 per cent. of the fluorspar output in this country and that another 33 per cent. comes from mines just across the river in Kentucky, making a total of 94 per cent. of the country's fluorspar production within a radius of 100 mi.

Among those present were: J. M. Blaney, general manager of the Rosiclare Lead & Fluorspar Co.; G. H. Jones, president, Hillside Fluorspar Mines; John Millhouse, director, State Bureau of Mines and Minerals; J. H. Blee, superintendent, Benzoin Fluorspar Co.

Benton, Arkansas, Gets $40,000 Bauxite Plant

★ The Standard Bauxite & Chemical Co. is erecting a plant at Benton, Ark., at a cost of about $40,000. W. E. Thompson will be superintendent of the company, and Frank Finsthwit, of New York City, is president.

Sand Barge Damaged in Storm on Lake Michigan

The barge *Brandon*, engaged in hauling sand across Lake Michigan from Muskegon, Mich., to Milwaukee, Wis., arrived in port at Muskegon Sunday, Oct. 30, nearly a day overdue and badly damaged after having been buffeted about in one of the severest autumn storms ever experienced in that section. Marine shipping suffered heavy damages and coast guards at Muskegon were forced to rescue the crew of a fishing boat which became disabled in the mountainous waves.

California Stone Plant Badly Damaged by Fire

The plant of the Kaweah Quarry Co. located at Lemon Cove, Cal., in Tulare County, was practically destroyed by fire recently with estimates placing the damage as high as $100,000.

The principal loss was the building containing all the crushing and pulverizing equipment. Three storage houses also burned and the fire reached a string of loaded freight cars on an adjacent side-track.

A. C. Root is the owner of the plant.

Two Portable Plants Help Permanent Plant

The Missouri Sand & Gravel Co., a subsidiary of the Moline Consumers Co. of Moline, Ill., is operating two portable plants to supplement its permanent plant at LaGrange, Mo. One of the plants is at Plainville and the other at Montezuma, Ill.

Indiana Firm Building Stone Plant at Blocher

★ The Sellersburg Stone Co., is reported to have leased a stone quarry 2 mi. south of Blocher, Ind., and to be installing machinery for permanent operation. The company has an initial contract for 15,000 cu. yd. of material for highway work.

"Zebrastone:" Colorful Wisconsin Discovery

OCCURS IN POTSDAM SANDSTONE

The discovery of a peculiar rock formation in a quarry near Alma Center, Wis., has created a new industry for that village and promises to be a source of employment for some years to come. This rock, called "zebrastone," was found in the Janke quarry west of Alma Center. Several Madison men have organized a company to develop the quarry commercially and have taken a 5-yr. lease on the property.

The stones are named after their unusual markings, some of them having stripes that resemble a zebra's in color and form. On some of the stones the stripes run in perfect horizontal lines, while on others they are in waves and fantastic designs. The colors appearing most often are white, yellow, red, brown and black. According to geologists, the coloring is caused by a solution of iron and the stripes are as permanent as the rocks themselves. The formation is said to be very rare and is in the Potsdam sandstone.

Most of the demand for this stone is for rock gardens and it is claimed that orders are on hand for several carloads to be used for this purpose. That this venture should prove profitable is evident from the fact that man-size stones sell for from 25 c. to $1, depending on their beauty and coloring.

Salt Plant Is Nearing Completion in Nevada

★ The Burnham Chemical Co., Reno, Nev., is making rapid progress on its salt plant at Searles Lake, Westend, Cal., and expects to be in full operation shortly. Most of the equipment has been installed and one of the salt wells is producing.

Penn.-Dixie Purchases 150,000 Tons of Stone

The Winterset Limestone Co., Winterset, Ia., has been given a contract by the Pennsylvania-Dixie Cement Corp. to furnish 150,000 tons of stone for its plant at Des Moines, Ia., in 1933. As a result, operations will probably be carried on at the quarry most of the winter.

Group Life Insurance Adopted by Gravel Firm

The Independent Gravel Co., Joplin, Mo., recently adopted an employee's group life-insurance program, supplemented by accident and health benefits. The Metropolitan Life Insurance Co. is administering the plan on a coöperative basis, with the company and its employees sharing the cost. The company's plant at Hannibal, Mo., is also included in this plan.

Cement Men Protest Puerto Rico Dumping

AMERICAN TRADE LOSING PLACE

American producers of Portland cement will be forced out of the Puerto Rico market unless the Bureau of Customs finds that foreign competitors are violating the anti-dumping provision of the tariff act of 1921, Commissioner F. X. A. Eble was told by representatives of the trade at a public hearing in Washington, Oct. 26.

J. B. Johnson of Chicago and W. F. Ives of Tampa, Fla., representing the Florida Portland Cement Co., presented the case for the domestic producers, quoting market prices in the island and production costs here, but they were unable to enlighten Commissioner Eble as to production costs in the competing European countries —Denmark and Belgium—and in Cuba.

A ray of hope, or at least assurance that the federal bureau will make efforts to protect the industry, appeared when the commissioner said: "If American industries are being driven from an American market, it would appear to be quite conclusive [that the anti-dumping provision is bein violated]." Mr. Eble added: "But there is another factor, that of actually showing dumping within the meaning of the law, and we must have such information before we can act."

It was shown by the introduction of a statement prepared by the domestic producers that foreign cement sells in Puerto Rico for much less than that which is made in the United States in the eastern gulf tidewater district.

Because the island is a possession of the United States, it is covered by the tariff-act provisions. The anti-dumping clause authorizes the secretary of the treasury to conduct investigations, upon complaint, to determine whether foreign producers are exporting commodities to the United States, or its possessions, at prices lower than actual production costs. Where such a condition is found, and it is determined that the action does injury to an American industry, or is likely so to do, or that it has the tendency to prevent the organization of a new industry here, the secretary is authorized to place additional levies at ports of entry to equalize competition.

The Portland-cement producers came to the customs bureau to ask that such a finding be made and that the levies permitted by the revenue act be imposed.

Dealing particularly with the experience of his own plant, Mr. Johnson said operations began in 1927 in a $6,000,000 establishment, and that the Puerto Rico trade was first sought in 1929. The plant was built in the tidewater region, and the attendant additional expense assumed for the purpose of serving the near islands. Operating possibilities were placed at 1,500,000 bbl. of Portland cement a year.

Illustrative of the cement business in Puerto Rico since 1926, Mr. Johnson submitted the accompanying figures, showing importations from foreign countries, particularly Denmark, and those from the United States, together with the percentage each bears to the total.

The cement was landed in Puerto Rico from foreign countries at $1.61 a bbl., including the 23-per cent. duty imposed in the tariff act, while the American product was offered for sale at $1.87 a bbl. Copies of communications from purchasers in the island were presented to show that the American cement was favored as to quality, but that, the price element being considered, orders were placed for that which was brought in from Denmark.

Efforts had been made by the American interests to meet the price competition, the commissioner was told, and in support of this statement it was shown that 1929 prices of $2.55 a bbl. were cut to the present $1.87. Actual production costs here are $1.333 a bbl., Mr. Johnson said.

The Puerto Rico market is being held to a certain degree but at a loss, the domestic interests pointed out, and they advised Commissioner Elbe that, when the 23-per cent. tariff was levied, foreign producers absorbed this charge without increasing their prices.

Mr. Ives testified as to the business methods employed. He stated the principal user of cement on the island is the insular government, whose contracts are given to the lowest bidders. Competition under the existing conditions has been impossible and has taken from the American producers their best prospect, he pointed out.

In the commissioner's possession is a brief filled by the Danish legation in the interest of its home producers in which charges of dumping were emphatically denied, and the claim advanced that Puerto Rico has been a natural market. The difficulties of the American makers of Portland cement are due to their inability to meet a quality product on a price basis, the brief is said to explain.

Questions directed at the witnesses by Commissioner Elbe showed clearly that they were not in possession of figures showing production costs in competing countries. He reminded them that to invoke the anti-dumping clause it must be shown that the market price at Puerto Rico is lower than the market price in the country of origin.

For the purpose of allowing domestic interests to prepare a statement setting out definite losses, traceable to dumping, Commissioner Elbe agreed to hold the record open until Nov. 5.

IMPORTS OF CEMENT BY PUERTO RICO

Year	Foreign Cement		American Cement	
	Bbl.	*Per Cent.*	*Bbl.*	*Per Cent.*
1926	316,484	79.4	82,020	20.6
1927	319,653	75.5	103,741	24.5
1928	324,186	87.4	46,700	12.6
1929	278,214	85.9	45,397	14.1
1930	214,549	79.8	54,193	20.2
1931	145,208	69.2	67,794	31.8
1932*	86,131	75.9	27,342	24.1

*First 8 months.

New Concrete Storage Bins Help Shipments

★ The Gloede Sand & Gravel Co. has for years operated a plant a few miles from Racine, Wis., making all shipments to that city with a fleet of 12 motor trucks. Recently the demand for its material has been heavy and the company fell behind in its shipments at times. To eliminate this condition a set of concrete storage-bins has been erected at a centrally-located point in the city. Material is hauled to these bins by car or truck as desired, the trucks being used on days when deliveries are slack.

The materials for the bins are discharged from the cars or trucks on a Barber-Greene belt-conveyor, which feeds a new 3-ft. by 8-ft. Universal vibrating screen from which they are discharged to the bins.

Railroad Is Exhibiting 14 Varieties of Marble

The Milwaukee Railroad recently placed on exhibit at Butte, Mont., a display of 14 distinct varieties of marbles coming from a 220-acre deposit located on Pike's Peak Creek, at Gold Creek, Mont. Authorities on fine marble are very optimistic as to its possibilities and expect the deposit to amply justify its future exploitation.

Limestone Plant for Water Shipment Planned

★ A. D. Paten & Co., Seattle, Wash., is reported to have plans under way for the development of a limestone deposit at Eastsound, Wash., where a plant is to be built and a dock for water shipments.

First Foreign Order in Years Goes to Ottawa

The Ottawa Silica Co., Ottawa, Ill., recently shipped a ton of silica sand to a cement company in Great Britain. George A. Thornton, secretary and treasurer of the company, said that this was the first foreign shipment the company had made in several years.

Rockland Installs New Lime-Making Machinery

★ The Rockland & Rockport Lime Corp., Rockland, Maine, is installing machinery for the production of lime. This will replace the equipment lost in a fire at the plant last July.

Producers Open Land to Employee Tillage

TIMBER AVAILABLE FOR FUEL

The Michigan Limestone & Chemical Co. has done much during the past years to compensate the employees at its Rogers City, Mich. plant for the fact that business conditions have justified only part-time operation. Plots of ground 50 by 100 ft. were let out to employees wishing to take advantage of the opportunity and assistance was given by the company in obtaining seeds, combating various difficulties and in watering during the dry season. As a result employees were able to raise their entire summer's needs of vegetables and to lay aside enough for most of the winter.

The company also coöperated with the Great Lakes Portland Cement Co. in another community project. Employees of these companies were allowed to cut wood on the various tracts of land owned by the companies in the vicinity. Everyone has a sufficient supply of fuel for the winter.

Milwaukee Locomotive Absorbed by Whitcomb

The Whitcomb Locomotive Co. of Rochelle, Ill., subsidiary of the Baldwin Locomotive Works, has announced its acquisition as of July 19 of the business inventory and good-will of the Milwaukee Locomotive Mfg. Co. under a plan whereby the Westinghouse Air Brake Co., formerly the owner of the Milwaukee Locomotive Mfg. Co., becomes a stockholder in the Whitcomb Locomotive Co.

The Milwaukee Locomotive Mfg. Co. was organized under Wisconsin laws in Oct. 1907 and has been in the internal-combustion locomotive business since 1909. Originally its manufacturing operations were separately conducted, but for many years past the company's manufacture has been carried on in a department of the National Brake & Electric Co. of Milwaukee, which is in turn a wholly-owned subsidiary of the Westinghouse Air Brake Co.

Milwaukee internal-combustion locomotives range from 4 to 20 tons, all powered with gasoline engines and all equipped with mechanical transmission. Available gages are 18 to 56½ in. The inventory of the Milwaukee Locomotive Mfg. Co., which has been completely transferred to the plant of the Whitcomb Locomotive Co. at Rochelle, Ill., includes 30 locomotives ranging from 4 tons to 16 tons in weight, together with a large stock of repair parts and all records, patterns and necessary tools, thus insuring present and prospective owners of Milwaukee locomotives an uninterrupted, efficient and permanent service. In addition to the above inventory, the Whitcomb Locomotive Co. has acquired four Milwaukee locomotives which are stored and available for immediate delivery on the Pacific Coast.

Sales of Milwaukee locomotives and parts will be conducted by the Whitcomb Locomotive Co. through its home office at Rochelle, and through its district offices and agents. Export sales will be handled by the Baldwin Locomotive Works, except in Canada, Mexico, Japan, Korea, South Manchuria and Russia, where Milwaukee sales will be conducted through the Whitcomb representatives in those territories.

Silica Pulverizing and Packing Plant Going Up

★ The Silica Products Co., Kansas City, Mo., has been carrying on an extensive rebuilding program at its Clay Spur, Wyo., bentonite-processing plant which was almost entirely destroyed by fire late last year. Rebuilding of the raw crushing and pulverizing department was completed in July. On Oct. 1 construction was started on the pulverizing and packing portion of the plant and this is expected to be ready to operate about Dec. 1. The entire new plant is of fireproof construction with the most modern, automatically-controlled equipment available.

The pulverizing and packing plant consists of a Raymond Bros. air-swept roller mill, a series of cone-bottom storage-tanks and two 2-tube Bates packers. Power is supplied by two Fairbanks-Morse engine-generator sets of 420 combined hp. The plant has a daily capacity of 150 tons of dried and 75 tons of pulverized material.

Plant's First Limestone Goes Into Sugar Making

The Valley Lime Co. of Lindsay, Cal., recently made its first shipment of limestone from its deposits near Rawhide. An order for 1,000 tons for a large sugar-refining company is now being filled. The results obtained from this shipment will determine suitability of the stone for this purpose. Six men are now employed at the quarry but if results are satisfactory it is expected that a total force of about 40 men will be required. E. H. McEuen, president of the company, is in charge of operations.

Dredge Sunk in Storm Is Undergoing Repairs

One of the dredges owned by the Tecumseh Sand & Gravel Co., at Tecumseh, Mich., which sank in the pond at the company's deposit in September, has been raised and workmen are busy repairing the vessel. Equipment damaged when the boat went under water during a heavy storm included a Diesel engine, the dredge pump and a small crusher.

★ Meeting Competition by *Beating It!*

Items in these pages marked with a star call attention to those alert producers who are awake to the arrival of an era of good business and who are expressing their faith in the future by buying and installing their needed equipment NOW.

★ The Burbank Rock Products Co., Ltd., Burbank, Cal., is adding to its rock bunker at 11001 Victory Blvd., in the Van Nuys District, near Los Angeles, Cal.

* * *

★ Jorge Bird Arias, operator of a lime plant at Fajardo, Puerto Rico, recently installed a Raymond roller mill for the production of whiting.

* * *

★ The Holmes Lime & Cement Co., Felton, Cal., is reported to be making improvements and installing new equipment in its plant there.

* * *

★ The Duquesne Slag Products Co. is reported to be building a loading dock on Monongahela River near Dravosburg, Pa.

* * *

★ A 5½-ft. Symons cone crusher was recently installed in the new gravel plant of the Construction Materials Co., at Ferrysburg, Mich.

McGree's Stone Plant Is Separate Enterprise

The Mankato Crushed Stone Co., St. Paul, Minn., was formed recently. This incorporates separately the crushed-stone plant formerly owned and operated by McGree & Co. The incorporators are Fred B. Desch, A. A. McGree, and Guy Chase.

Highway Gravel Plant Rising on Pease River

★ The Zempter Construction Co., Dallas, Tex., is reported to be erecting a gravel plant on Pease River near Quanah, Tex. The material produced is to be used for road work.

Crushed-Stone Plant Buys Screen Equipment

★ New screens have been added and changes made to the crushed-stone plant of the city of Bethany, Mo. Thirty-eight employees have been called back to supply material for highway work.

The Franklin County Board of Supervisors, B. T. Turner, chairman, Rocky Mount, Va., plans the erection of lime-grinding plant in Pittsylvania.

Editorials

The Return of Sanity

BUSINESS depression is the natural outgrowth of mental depression. Every slump in business follow's a slump in confidence, a temporary loss of faith in the basic soundness of the country and its industries. Without an unhealthy mental atmosphere in which to germinate, no rumors of impending commercial disaster could make the slightest headway against the overwhelming evidence of fundamental stability that lies everywhere about us. Among a people accustomed to straight thinking and versed in the principles of sound economy it would be impossible to create the state of mind that begets mob panic.

In every period of business depression history repeats itself in its main outlines. The excuses are the same, the evasion of responsibility is true to form; only the labels show variation. Nowadays the too ardent "wets" blame prohibition for all our business ills while the equally ardent "drys" attribute them to lack of law enforcement. Not so long ago the capitalists were deploring the growth of radicalism—a few can still be heard—and Socialists shouted "Down with capitalism!" and "Put an end to money-rule!" To-day independent merchants scowl at chain-store and mail-order-house competition and "big business" bewails the economic waste of small-scale enterprise. It was but as yesterday when labor accused the employer of profiteering and the latter charged the worker with "soldiering" and *sabotage*. Accusing fingers point in a "vicious circle" from one man to another, everyone insisting upon his own innocence while loudly asserting his neighbor's guilt. In our zeal to expose the other man's responsibility too many of us have failed to realize the part we ourselves play in spreading the contagion of "bad business."

In our sober moments—and this post-election period is one of these—we, of course, recognize this boyish nonsense and appraise it at its true value. We realize, on reflection, that what we need is not new scape-goats but new thinking, that the situation demands less carping criticism and more intensive study. Since business consists of buying and selling we should not need to be told that, if there is a slump in buying, there must be a corresponding slump in selling, and that while differences in conditions may affect the speed with which the result follows the cause, they can not disturb the casual relationship that exists between one and the other.

No one can deny that we spend easily and cheerfully when we can, yet the fact that we spend stupendous amounts without much if any coercion seems to have given us no skill in spending either timely or wisely. What is done easily is not always done well, and we are still poor managers of income. We have still to discover the secret of how to carry over the surplus of a good year to relieve the dearth of what is otherwise a poor year. Clearly this is no peculiarly American weakness, since most of the civilized world has been struggling to recover from what is described as "bad business," but it is one under which we have suffered greatly because of the scale of our operations. Our manufacturers of common-use commodities have achieved well-deserved success in teaching us to spend freely—a course of training that encounters little resistance from the modern man—but they have not shown us when or how to spend wisely, and, in spite of numerous economic crises, we have not discovered it from observation.

A thoughtful observer of business conditions recently remarked that "in times of prosperity the American people spend like drunken sailors, and in times of depression they hoard like misers." One has but to compare bank clearings in times of "good" business with savings-bank deposits and safe-deposit-box rentals in times of "bad" business to realize the full significance of this statement. Thrift is certainly not a common virtue.

Business can never be permanently prosperous—that is to say, permanently rid of the depression bugbear—until we have learned how to spend carefully when we are able to spend, so as to have a surplus for spending when times are "bad." Although modern interpretations of what constitutes good business practice under present income-tax regulations have largely discouraged the habit, the soundest and most wisely managed concerns in times of prosperity withhold from their stockholders all their profits above a reasonable dividend return on the capital invested and pass this amount to their surplus account, where it can be drawn upon, if needed, in some future period of possibly slender gains. No less prudent policy can avert the losses of confidence that have marked all our business crises.

Confidence has been restored to the majority of the American people and the change, although long in the making, came in the twinkling of an eye. On a Monday it was absent; by the next evening it had returned. Just so quickly does popular opinion swing from one pole to the other. If we would retain the confidence that is now uppermost, we must adopt those policies—not political alone, but commercial and individual as well—that keep public attention focused on permament gains and long-

time trends. That has been the lesson of every business depression; it is likewise the lesson of the last one. Perhaps, in view of the severity of our recent experience, the lesson has been better learned; certainly its truths have been burned deeply into millions of depression-scarred hearts and minds and they should be as clearly as they have been painfully evident.

We believe that the lesson has been learned and we believe, too, that it will not be quickly or readily forgotten. That is why we venture to call this period "the return to sanity."

Raise Wages First

FOR several months the trend of the business-volume curve has been upward, more rapidly upward than the seasonal norm. Collections, too, have improved from the freeing of millions of dollars that had been withdrawn and withheld from circulation. Marked gains in public confidence are responsible for the wholesome recovery that has been evident in many lines of business.

The increases have not yet been of sufficient magnitude to restore most business operations to a profit-making basis, but they have been large enough, general enough and steady enough to presage the return of profits in the not-far-distant future. The gains that have already been observed, as well as those that are to come within the next few months, deserve special attention in view of conditions. They need more intelligent study than has been given to them in former periods of recovery, for we have learned much more than we formerly knew about the interrelations of employer and worker and of the complete dependence of business on popular commodity demand. Business men, therefore, must give serious consideration to the problem of what is to be done with the first gains of business recovery.

With stockholders crying for dividends, with private owners of business hungry for gains to replace the actual and paper losses of recent years, the temptation to pass the first fruits to the profit account will be great. To many men, whether individual owners of their businesses or the directors to whom stockholders look, this temptation will be too great and the first gains will go to capital. There are some, however, who have learned the true dependence of business upon the consumer and who, for that reason, will at least question the advisability of attempting to restore profits before wages. The more deeply they consider the inevitable effects of their contemplated action, the more they are likely to be guided by the long-term results. These are the leaders in the advance of modern industrial thought and they will ultimately reap the rewards of courage and foresight.

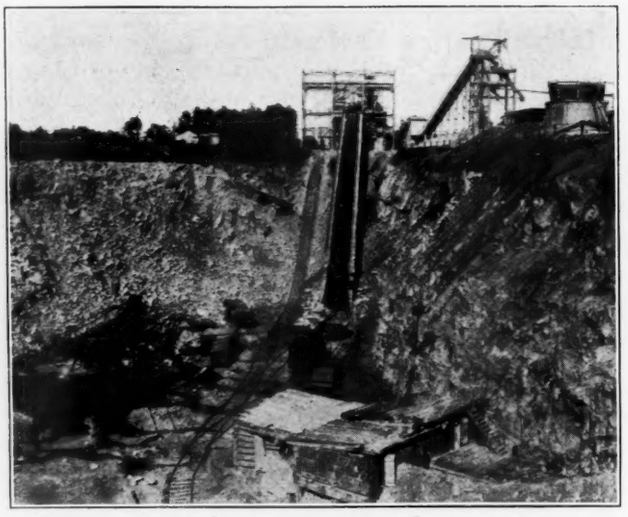
It seems impossible that anyone should fail to understand that our late difficulties have been greatly increased by the inability of the general public to buy in customary amounts the commodities of general consumption; that the sharp decline in the purchase of the necessaries of life which followed the general decrease in wages accentuated the pains of business and finally brought it to the verge of stagnation. There may be a reduction or even a complete cessation of the public's consumption of jewelry, fur coats, interior decorations and the other ultra-luxuries of life and business may feel only slight effects of the change, but let there be a material decrease in the public's consumption of clothing, housing facilities, food, fuel and transportation and industrial collapse is inescapable. The luxuries represent the surplus earning capacity of some people and the ostentation-gratifying desire of others and, accordingly, they form but a small portion of the nation's total expenditures. No nation—one might almost say not even a single community—can survive on the profits of luxury consumption.

The profits of business, as indicated by stock dividends, find their way partly into such luxury consumption but chiefly into the field of investment, where, if we never knew it before, we now know that too much money has already been placed. Surplus capital seeking profitable investment adds to the production facilities of all the industries into which it penetrates and, in so doing, it increases the competition and reduces the prices (and, so, the profits) in all the trades it affects and, in turn, depresses the profit-making possibilities of related industries. It builds unnecessary production facilities, it creates false expectations, it takes from the field of general-commodity consumption the buying capacity that would keep existing factories busy.

It is because this truth is becoming more and more evident that business men hesitate before distributing the first profits of recovering business wholly or even partly among those who have little general-commodity consuming power. Instead, they want to spread it where it will be spent for commodities that will sustain all industry and not merely the luxury-producing parts of it and where that spending will be undertaken at once in order to meet the demands born of long-continued self-denial. And this means that, to satisfy that desire, they will disburse their first gains either partly or wholly in the form of wage increases, which will find their way almost immediately into the general market on which general business lives and thrives. They are determined to restore first the crippled buying power of the masses, knowing that, from the long-term point of view, this will bring them the greatest and most secure gains in the long run. Maintain the general public's buying power in a healthy condition, and the profits of business will take care of themselves. This is the intensely practical truth that lies at the bottom of what the old-time business man called the "reformer's altruism." The more modern industrialist terms it "intelligent self-interest."

Steel Company's Stone Quarry Furnishes Fluxing Material for Furnaces

Drilling the deposit. Note unusual surface formation and clean stripping.



Looking toward plant from quarry face. Pump house in right foreground.

By W. E. TRAUFFER

THE Tennessee Coal, Iron & R. R. Co., the largest producer of steel and iron in the South, operates two new crushed-stone plants near Bessemer, Ala., which rank among the best in the country. Both plants are simple in design, of permanent construction and are extremely economical to operate. Because of the fact that their entire product is consumed by the company and that their material is not sold in competition with other crushed-stone plants, they have not been given the publicity which they deserve.

The limestone mine at the Muscoda plant is an unusual and interesting operation and the manner in which it was developed and is now operated should make instructive reading for any mine or quarry operator. A complete description of these operations was published in the Oct. 5, 1932 issue of PIT & QUARRY. The Muscoda plant produces 2-in. to 8-in. lump limestone for the company's open-hearth steel furnaces and .063-in. to 1⅜-in. limestone for lime burning for open-hearth furnaces. At Dolonah ½-in. to 2¾-in. dolomite rock for blast-furnace flux and .063-in. to ½-in. rock are produced. The latter is calcined at the company's lime plant and is used in all the open-hearth furnaces.

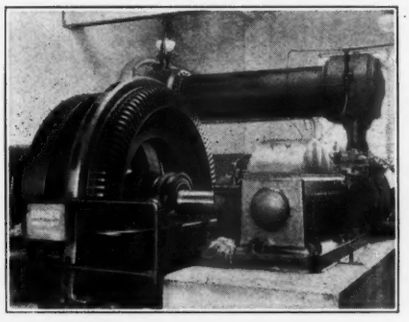
The 3-cu. yd. full-revolving electric shovel loading 10-ton cars in the Dolonah quarry.

An average analysis of the stone as shipped is given below:

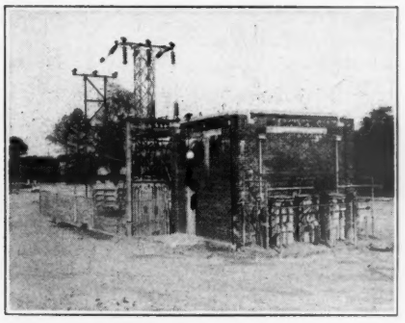
Silica	Met. Iron	Alumina	$CaCO_3$	$MgCO_3$
1.17%	.21%	.43%	54.89%	42.74%

The Dolonah quarry and the plant, which has a capacity of 150 tons per hr., are completely described in this article.

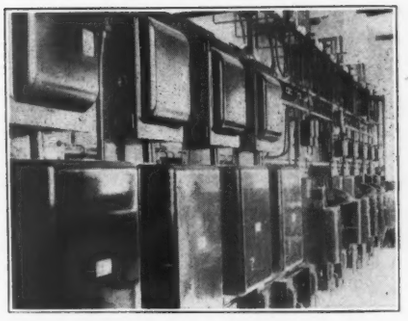
The Dolonah dolomite quarry and crushing plant are located about 2 mi. west of Bessemer, Ala., and were opened to take the place of the Ketona quarry, which was later abandoned and dismantled. The crushing plant was not ready for operation until June, 1931, but stripping of the deposit was begun in September, 1927. Seven acres have been stripped to date. Sinking of the quarry incline was begun in October, 1928. Hand loading was employed until a cut averaging 54 ft. in width was completed to a temporary 50-ft. level. Then an electric shovel was installed and the face extended to a length of about 400 ft.



The compressor in the main plant building.



The outdoor sub-station and the switch-house.

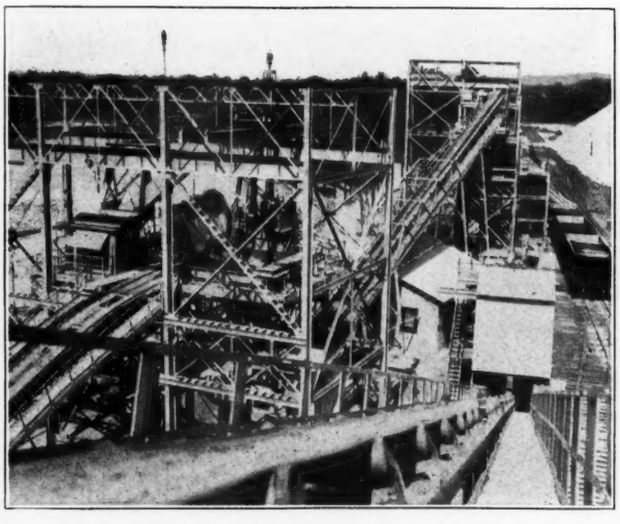


Main plant switches in the switch-house.

A permanent level was then opened by electric shovel at a depth of 70 ft. After the face was again extended a steel incline was built from the quarry floor to the primary crusher in the plant.

The overburden averages 12 ft. in thickness and was removed by a shovel which loaded it into cars hauled away by steam locomotives. Some of this earth was used for the railway fill at the plant and for an embankment which protects the quarry from a nearby creek which floods in rainy seasons. The company is diverting this creek around the quarry at great expense further to reduce the seepage and the danger of the quarry becoming flooded. After stripping by shovel hand cleaning was necessary because of the irregular nature of the top of the deposit. Skip buckets, with a capacity of 9 cu.ft. each, were loaded by hand and unloaded by a derrick into the cars.

Drilling of blast holes is done by an electric blast-hole drill with a 10-hp. motor and a 5¾-in. bit. Holes are being drilled 70 ft. deep in a single row along a 300-ft. face. They are drilled, on an average, from 15 to 18 ft. back from the face and are spaced from 12 to 20 ft. apart due to the unevenness of the formation. The charges in the holes vary for the same reason. Gelatin dynamite is used exclusively, with 60-per cent. at the bottoms and 40-per cent. at the tops of the holes. Safety fuse is used. Some secondary drilling is necessary and this is done with jackhammers. Bowlders on the surface of the deposit are drilled and blasted before the large shots are made. A small larry, operated by a single drum hoist with a 100-hp. motor, is used to haul tools and materials to and from the quarry.



Looking from loading building down on crushing and screening buildings.

A 150-ton full-revolving electric shovel loads the stone into the quarry cars. Although a 4-cu.yd. dipper is standard for this shovel, a 3-cu.yd. dipper is used. The cars are standard-gage 10-ton steel side-dump units of the company's own make and are hauled, in trains of 3 cars each, to the foot of the quarry incline.

The cars are drawn up the incline one at a time by a 350-hp. single-drum hoist which is placed on ground-level, is operated by a remote magnetic control from the top of the incline, and has dynamic braking in addition to the regular gravity-type brake. The contents of the cars is dumped into the primary crusher by a hook operated by an electric hoist on ground-level and suspended by a sheave from a steel cantilever arm over the crusher. This is also controlled by the hoist operator from his station near. A 30-ton overhead traveling crane serves the entire crusher building. A small electric hoist, suspended from the crane hook, handles a stone hook which keeps the primary crusher from choking. Another beam and hook can dump the cars in the opposite direction through a chute to cars on a track below. This is used to remove waste material from the quarry without running it through the plant.

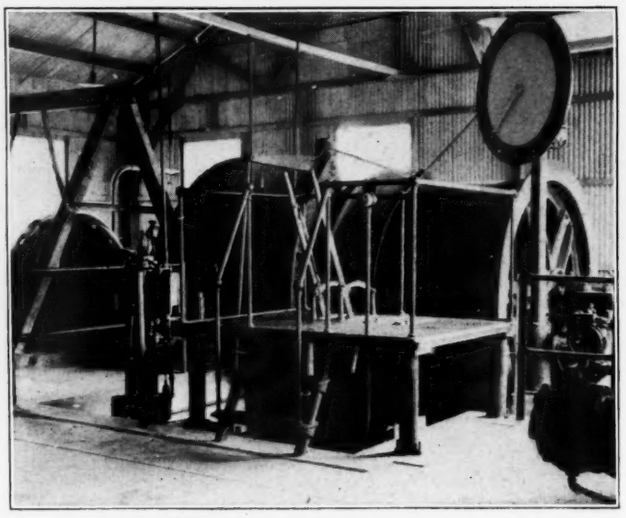
The 42-in. gyratory primary crusher reduces the material to 6 in. and under. It discharges to a 36-in. inclined belt-conveyor (No. 1) which operates on 176-ft. centers. This feeds directly to a 4-ft. by 10-ft. single-deck vibrating scalping screen which has 2¾-in. openings. The oversize goes directly to the No. 8 gyratory crusher which is set at 2¾-in. opening and discharges directly to a 4-ft. by 8½-ft. single-deck vibrating screen having ½-in. openings. A 20-ton overhead traveling crane serves the secondary crusher and other parts of this building. The fines from the scalping screen go to a second similar screen. The oversize (½-in. to 2¾-in.) from both these is chuted to railway cars on a siding alongside the plant to be used for blast-furnace flux. A door in the bottom of the chute allows this material to be diverted to a stock-piling system which will be described later. The fines from both

sizing screens go to a 3-ft. by 6½-ft. single-deck vibrating screen having wire cloth with .090-in. openings. This dewaters the material and removes the extreme fines which, with the water, go to a steel tailings sump-tank and are sent by an 8-in. centrifugal sand pump through a line to a waste pile from which they can be reclaimed whenever desired.

The oversize (.090-in. to ½-in.) from the dewatering screen normally goes through a chute to a 16-in. belt-conveyor (No. 3) operating on 143-ft. centers. A by-pass allows this material to be diverted to stock-piles, if desired. This conveyor can feed a set of 42-in. by 16-in. crushing rolls for further reduction, but at present this is being by-passed and the material is discharged direct to another 16-in. inclined belt-conveyor (No. 4) which operates on 178-ft. centers and carries it to the final washing building. This conveyor discharges to a second 3-ft. by 6½-ft. single-deck vibrating screen having .063-in. openings. This removes all extreme fines, which are flumed to a pump which rehandles it to a waste dump. The material (.063-in. to ½-in.) retained on this screen is chuted to railway cars on a siding for shipment to the company's lime plant. There is gravity storage for 50 empty cars on the fill above the plant.

As previously stated, the large product (½-in. to 2¾-in.) from the two sizing screens can be diverted to a stock-piling system. Instead of going to cars it is fed to a 30-in. belt-conveyor (No. 2) operating on 104-ft. centers. A second conveyor (No. 2a), similar to the above except that it is 16 in. wide, handles the screenings from the first washing screen when these are stock-piled. Both conveyors pass through a concrete culvert under the loading tracks, which are on a fill alongside the plant, and discharge to separate 15-ton compartments in a steel hopper. Each of the materials is loaded into small steel side-dump cars to be hauled by individual electric hoists and dumped on stock-piles, which are parallel to the plant and tracks. The stock-piling capacity for screenings is about 15,000 tons and that for flux about 60,000 tons, all which is reserve stone to be used in emergencies. A steam shovel rehandles the material to cars for shipment.

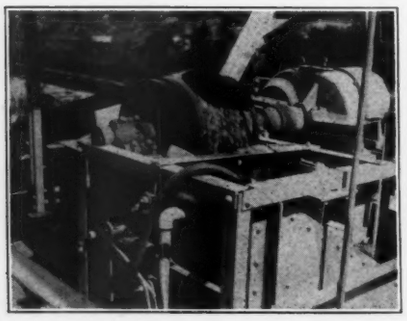
Because of the broken and stratified nature of the deposit considerable water seeps into the quarry from the creek and other sources. This is drained to a sump in the far corner of the quarry. A temporary timber pump-house contains five centrifugal pumps, two of 5,000- and one each of 5,600-, 3,000- and 2,500-gal. per min. capacities. The 3,000-gal. pump supplies wash water for the plant. All the others are quarry-drainage pumps, some of which are kept in reserve for heavy rains. The wash water is stored in a 50,000-gal. steel tank on the edge of the quarry. It is fed by gravity to three centrifugal pumps which are at the plant and supply pressure for the washing system and other purposes.



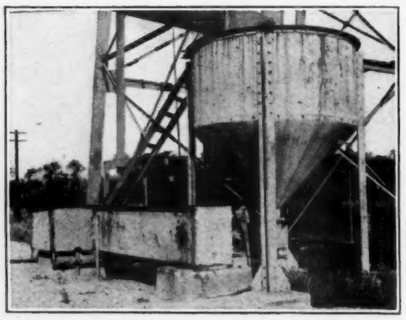
Hoist which hauls cars from quarry to primary crusher. Motor at left.

Each of the vibrating screens in the plant is equipped with sprays which give the material a thorough washing. The spray-pipes are original in design. Instead of cutting or boring holes or slots in the pipes, as is the usual practice, a method was developed which resulted in a much more efficient spray. Holes considerably larger than the spray-holes were first cut in the pipes and thin steel plates with accurately and cleanly cut slots were welded in place over them. The better washing efficiency of these sprays is evident from the greater cleanness of the material since they were installed.

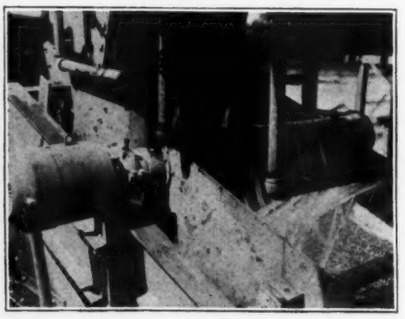
As at the Muscoda plant power comes from the company's Fairfield steam generating plant, which is tied in with the lines of the Alabama Power Co. It is received at the Dolonah plant at 44,000 v. and is reduced at a 3,000-kv.-a. outdoor substation to 2,200 v. for all except the screen and conveyor motors. The quarry pumps have 2,200-v. motors. The



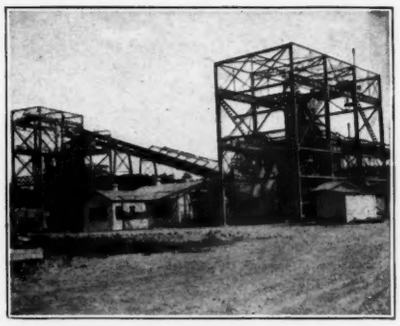
Speed-reducer drive of the loading belt-conveyor.



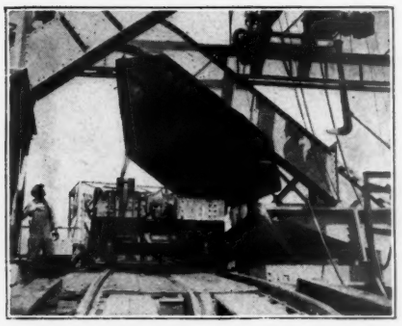
Inclosed pump and tank which handle waste.



One of the screens, showing the spray system.

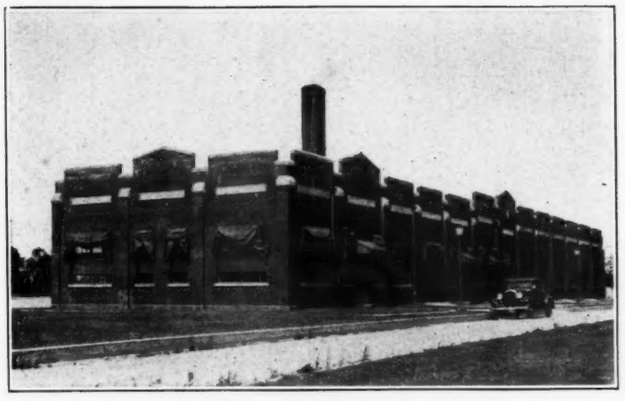


General view of plant with hoist house in center.



Car being dumped to primary crusher. Stone hook at right.

Screening and secondary crushing building.



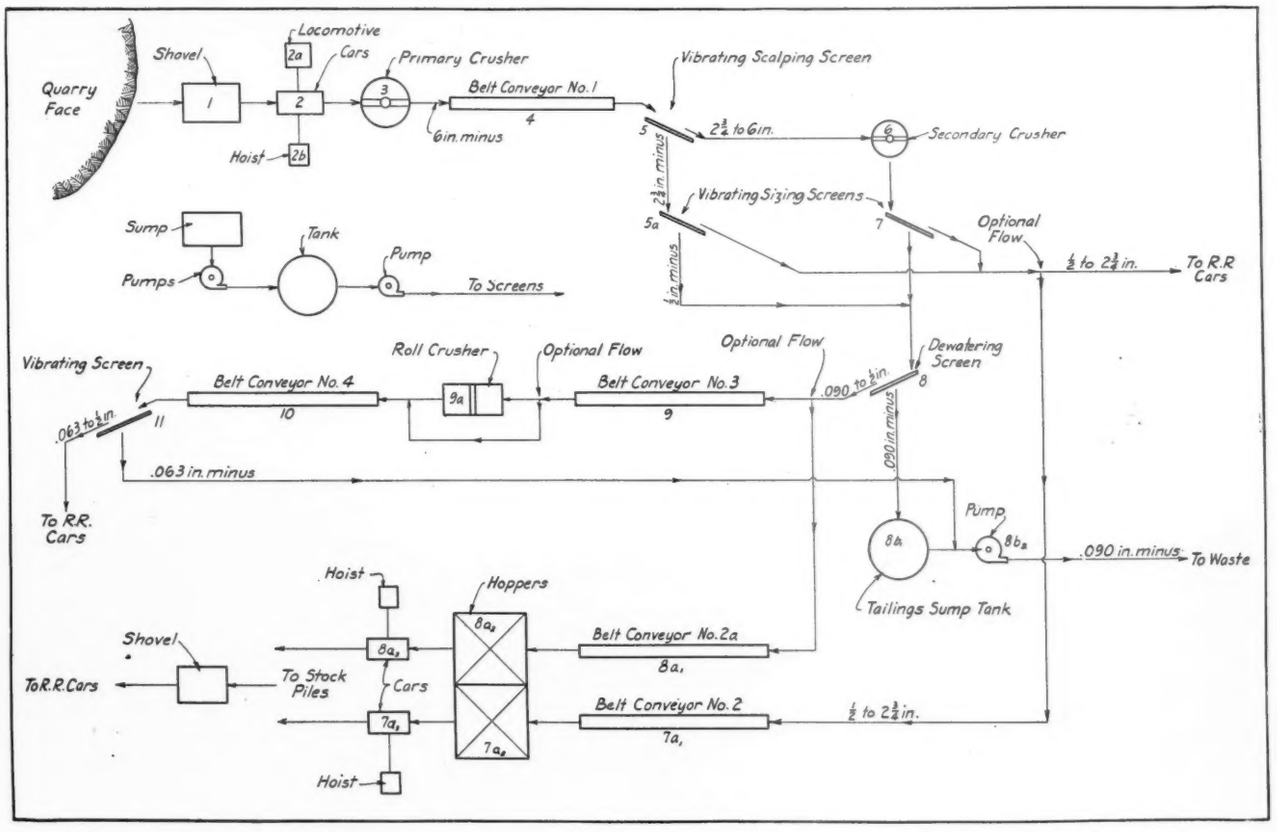
The main plant building containing offices, machine shop, storeroom, electrical shop, etc.

screen and conveyor motors are 220-v. A small motor-generator set furnishes direct current for excitation of the synchronous air-compressor motor.

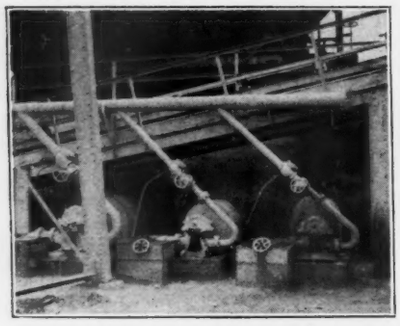
All motors except those for the quarry pumps are controlled from the switchroom under the secondary crusher. Each motor also has a local push-button. All plant motors are controlled by an automatic sequence starting-and-stopping system. Overheating of a motor bearing or a breakdown in the flow automatically stops all the plant machinery in sequence.

Like the Muscoda plant, this plant was designed by the engineering department of the company and was erected and had its equipment installed under their direction. The entire plant is of structural steel with steel-plate floors and stair treads. The inclosed parts of the plant have corrugated-metal siding and roofing. Foundations and crusher footings are of concrete. All the belt-conveyors are driven through speed-reducers and the screens and crushers through multiple V-belt drives.

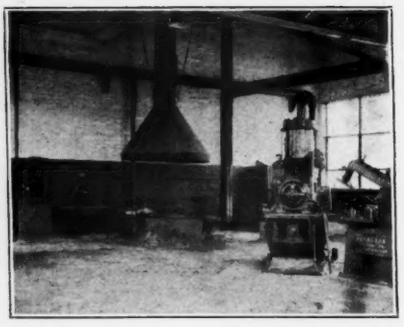
The company and its employees take great pride in this plant and every effort is made to keep it in first-class shape. The grounds about it and the



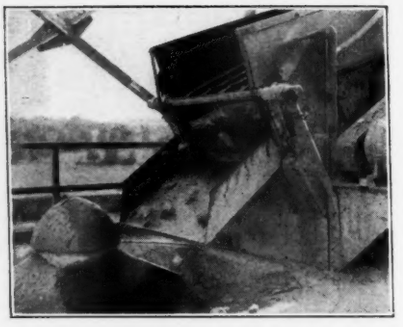
Flow-sheet of the crushed-stone quarry and plant of the Tennessee Coal, Iron & Railroad Co., at Dolonah, Ala.



Three pumps feeding the washing system.



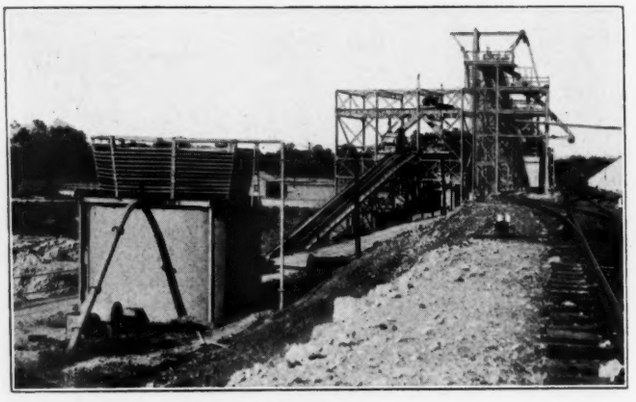
Interior of machine and blacksmith shop.



A vibrating screen and secondary crusher.

many miscellaneous buildings add to its attractiveness. All these buildings are made of concrete and brick and include an oil house, a switch and pump-control house, and the main plant building. The last-named is a one-story structure housing from left to right the plant offices, supply rooms, medical dispensary, shower and change rooms with hangers for clothing, compressor room, electrical repair shop, and a machine and blacksmith shop. Like the other buildings, this is a one-story brick-and-concrete structure with large steel-sash windows. A steam heating system has been installed in this building. Most of the minor plant-repair work is done in these shops, but the larger work is sent to the Muscoda shops. The supply room has neat racks for repair parts and supplies. The machine shop is completely equipped with forges, wheel-puller, emery wheel, trip hammer, hack saw, lathe, pipe-threader, drill and drill-sharpeners.

The grounds about the plant and office are sodded and all the driveways are surfaced with screenings. Near the plant are two separate small villages for the white and colored employees, most of whom live there. The houses are neat and clean and have all modern conveniences. They are rented by the company to its employees at very moderate rentals. The company also gives its employees the free use of spare ground on its property for cultivation.



Another view of plant with water-storage tank in foreground.

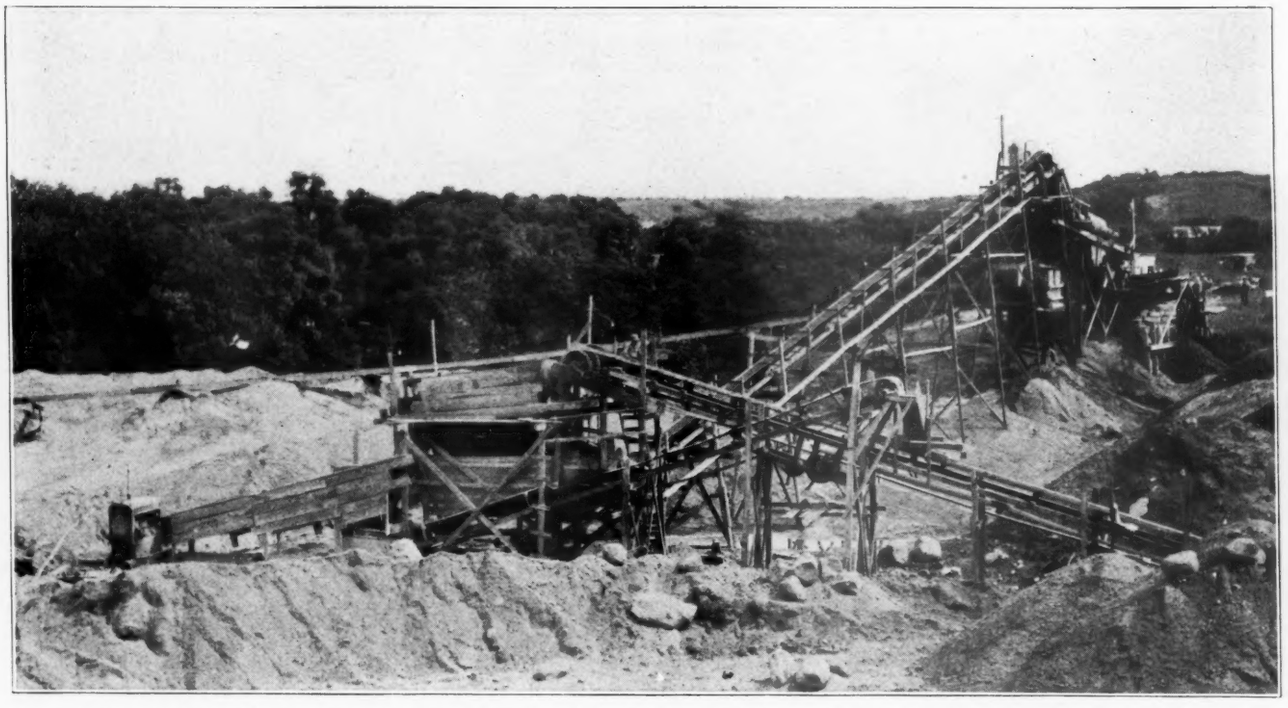
TABULAR ANALYSIS OF OPERATIONS AND EQUIPMENT OF THE TENNESSEE COAL, IRON & RAILROAD CO., PLANT AT DOLONAH, ALA.

(Key numbers refer to corresponding numbers on accompanying flow-sheet.)

Operation	Key	Equipment	Size, Capacity or Type	Power Source	Power Transmission
Loading and haulage to plant	1	Shovel	Electric, full revolving, 3-cu. yd.		
	2	Quarry cars	10-ton, steel side-dump		
	2a	Locomotive	38-ton, steam		
	2b	Hoist	1-drum	350-hp. motor	Speed-reducer gears
Primary crushing and scalping	3	Primary crusher	42-in., gyratory	200-hp. motor	Multiple V-belt
	4	Belt-conveyor (No. 1)	36-in., 176-ft. centers	75-hp. motor	Speed-reducer
	5	Scalping screen (Oversize to 6; throughs to 5a)	4-ft. by 10-ft., single-deck	7½-hp. motor	Multiple V-belt
Coarse separation	5a	Sizing screen (Oversize to cars or $7a_1$; throughs to 8)	4-ft. by 8½-ft., single-deck	5-hp. motor	Multiple V-belt
Secondary crushing and sizing	6	Secondary crusher	No. 8, gyratory	125-hp. motor	Multiple V-belt
	7	Sizing screen (Same flow as 5a)	4-ft. by 8½-ft., single-deck	5-hp. motor	Multiple V-belt
	8	Dewatering screen (Oversize to 8a, or 9; throughs to $8b_1$)	3-ft. by 6½-ft., single-deck	5-hp. motor	Multiple V-belt
Fines handling	9	Belt-conveyor (No. 3)	16-in., 143-ft. centers	5-hp. motor	Speed-reducer
Optional reduction	9a	Roll-crusher	42-in. by 16-in.	50-hp. motor	Belt
Fines washing and loading	10	Belt-conveyor (No. 4)	16-in., 178-ft. centers	7½-hp. motor	Speed-reducer
	11	Washing screen (Oversize to cars; throughs to $8b_2$)	3-ft. by 6½-ft., single-deck	5-hp. motor	Direct
Stock-piling: Screenings	$7a_1$	Belt-conveyor (No. 2)	30-in., 104-ft. centers	10-hp. motor	Speed-reducer
	$7a_2$	Hopper compartment	15-ton		
	$7a_3$	Car	4-ton		
Stock-piling: Flux	$8a_1$	Belt-conveyor (No. 2a)	16-in., 104-ft. centers	5-hp. motor	Speed-reducer
	$8a_2$	Hopper compartment	15-ton		
	$8a_3$	Car	4-ton		
Waste disposal	$8b_1$	Tailings sump tank	3,300-gal.		
	$8b_2$	Pump (To waste-pile)	8-in., centrifugal	50-hp. motor	Multiple V-belt
Water-supply		Pump	3,000-gal. per min.		
		Tank	50,000-gal., steel		
		Pumps (2)	500-gal. per min.	50-hp. motor	Direct
		Pump (1)	1,000-gal. per min.	75-hp. motor	Direct

Rochester Public Library

"Semi-Portable" Unit Augments Facilities of Permanent-Plant Operator



General view of plant with conveyor from hopper and scalping screens in foreground. Gasoline engine at left drives the two belt-conveyors, the screen and the crusher.

Provides Much-Desired Degree of Cheap, Quick and Easy Flexibility

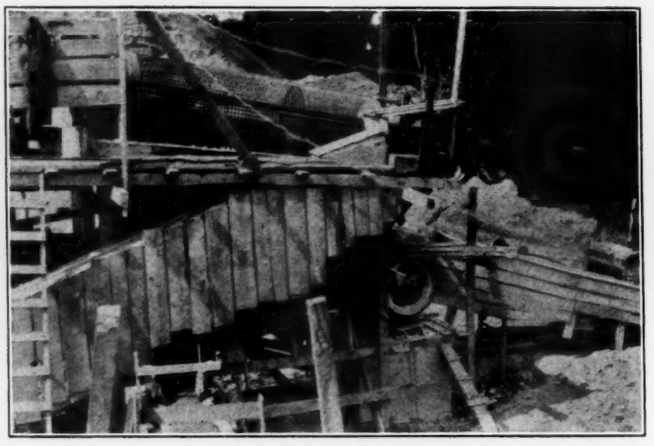
By W. E. TRAUFFER

DURING the past few years there has been a considerable increase in the number of portable plants producing materials in competition with permanent plants. Until recently most of these plants were operated by contractors or by independents, who would obtain a contract to furnish materials for a highway or other building job. In some states, where gravel or stone deposits are plentiful, these operators were able to underbid companies operating larger established plants and obtain contracts for work within a few miles of these plants.

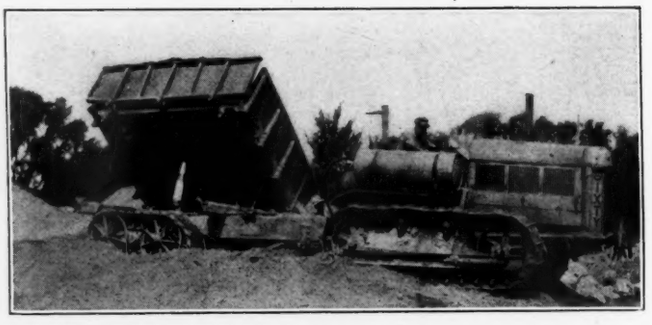
Many producers soon realized that the only way to meet this competition was to operate their own portable or "semi-portable" plants and get this business through their own superior knowledge and experience in the production of aggregates and their reputation among the users of this material. A number of producers have been doing this successfully for several years and the practice has spread to all parts of the country.

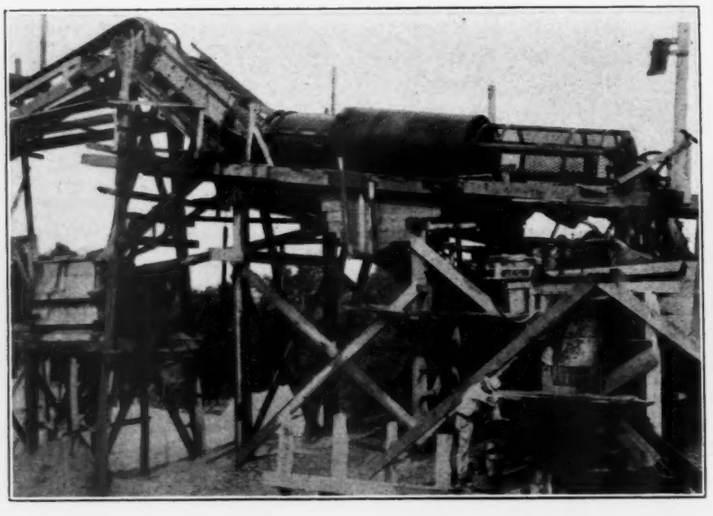
One of the best plants of this type to come to our notice recently is that of the Robbins, Young Co., at Correctionville, Ia. This company has a permanent sand-and-gravel plant at New London, Minn., and has in its organization men who have been in this field for many years and are familiar with all phases of the business. This new plant is of the so-called "semi-portable" type and was put in operation on August 16, 1932, to furnish aggregates for 8 mi. of concrete highway being built between Cushing and Holstein on Highway No. 20. This plant has equipment which can produce material as good as any produced by permanent plants and do so more economically than most of them. It is also sufficiently flexible to produce any gradation of material which might possibly be required for this class of work. At present concrete sand and ¼-in. to 1½-in. graded concrete gravel are being produced.

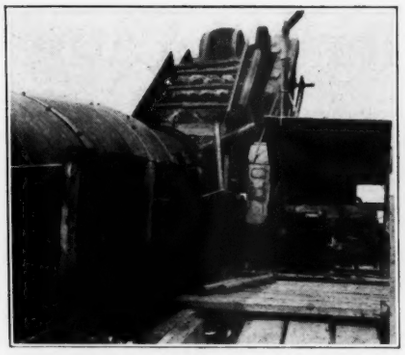
The plant is entirely of bolted wood-frame construction using no concrete except for the crusher foundation. It was built and put in operation within 10 days. After the present road job has been finished the plant can be torn down in 4 days and re-erected at another location in another 10 days. Two shifts of 10 hr. each are being worked and under this arrangement the plant is producing about 1,800 tons of usable material daily. Actually about 175 tons of material is run through the plant in an hour.



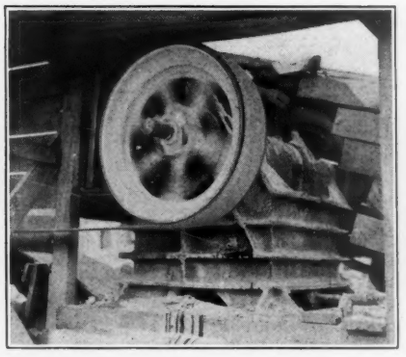
Above: Crane rehandling sized material to stock-pile. *In circle and at bottom:* Two views of screens and screw washer. *Top right:* Scalping screen and jaw crusher. *Right upper center:* Tractor-drawn crawler wagon dumping into plant hopper. *Right lower center:* Shovel loading crawler wagon in pit. *Bottom right:* Another view of crawler wagon dumping.



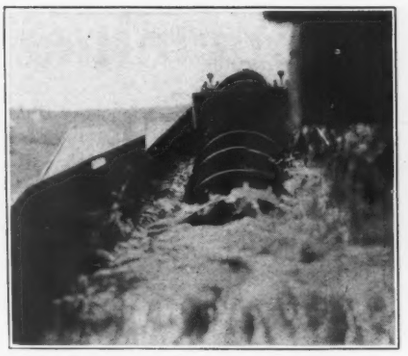




Vibrating and rotary sizing screens with engine at right.



Close view of the jaw crusher taken while running.



The single-screw gravel washer in operation.

but a large portion of this is excess sand and pea gravel which goes to waste. Belt-conveyors are used for all moving of materials in the plant and are large enough to allow the full capacity of the plant to be utilized.

This plant and its deposits are located about 2 mi. northeast of Correctionville, which is about 33 mi. east of Sioux City, Ia. The deposit has an overburden which is about 3 ft. in depth and was removed in advance of the operation of the plant. The equipment now used in the pit operation was employed to remove the overburden and haul it to waste. The deposit is a fairly clean material, averaging about 20 ft. in depth, and there is enough in the deposit for the present job. The material runs from 18 to 20 per cent. over ¼ in. in size and about 5 per cent. of this is large enough to require crushing.

In the pit a Northwest 1½-cu.yd. gasoline shovel loads an 8-cu.yd. Athey truss-wheel tractor wagon which is drawn by a Caterpillar 60 tractor. The present haul covers a distance of about 100 ft. to the plant. Later, when operations are farther removed, it may become necessary to use another tractor and wagon in order to keep the plant operating at capacity. The material is dumped from this wagon at the plant over a 6-in. rail-grizzly into a 20-cu.yd. steel-lined wooden hopper. The few stones that are too large to pass the bars are sledged through.

A hand-operated sliding gate controls the flow of material from the hopper to inclined belt-conveyor No. 1 which is 24 in. wide and operates on 80-ft. centers. It discharges to the 40-in. by 12-ft. revolving scalping screen, which has wire screen cloth with 1¾-in. openings. The oversize material from this screen is chuted to a 9-in. by 36-in. Wheeling roller-bearing jaw crusher which reduces it to 1¾ in. and under. The crushed gravel is discharged to return belt-conveyor No. 2, which is 24-in. wide, operates on 50-ft. centers and returns the material to belt-conveyor No. 1. The material passing through the scalping screen is chuted to inclined belt-conveyor No. 3, which is 24-in. wide and operates on 150-ft. centers.

This conveyor carries the material to the top of the screening and washing plant where it discharges on a 4-ft. by 8-ft. Link-Belt double-deck vibrating screen. This has ⅜-in. and 3/16-in. wire cloth on its top and bottom decks, respectively, and removes the sand, which is chuted to a wooden settling tank of the company's own design. The sand is discharged to a pile from which it is rehandled to a stock-pile by a crane. The overflow from the tank is flumed to waste. The gravel retained on the top deck of the vibrating screen is fed to a 48-in. by 24-in. Telsmith revolving screen, which has a 6-ft. scrubber section, and a 9-ft. section having 1-in. openings and a ¼-in. sand jacket extending its entire length. Another 9-ft. section with 1¾-in. openings is not being used.

The two sizes of gravel from this screen are fed together to a 40-in. horizontal belt-conveyor which is set on 10-ft. centers and feeds an Eagle 12-ft. single-screw gravel washer. This discharges to a perforated rinsing chute which separates and distributes the material to two ground-level timber storage-bunkers of about 50-ton capacity each. These are used solely for the purpose of allowing an inspection of the material to be made before it goes to storage. A Northwest gasoline crawler crane, with a 40-ft. boom and a ¾-cu.yd. Williams clam-shell bucket, rehandles the material from these bunkers, either to stock-piles or to one compartment of a 2-compartment truck-loading bin having a total capacity of 45 tons. The other compartment is used for sand, which is rehandled from stock-piles by the same crane. The crane is powered with a 65-hp. Climax gasoline engine. Equipped with a ¾-cu.yd. Page dragline bucket, this same crane was used, together with the shovel now being used in the pit, for stripping the deposit. Separate sizes of material are hauled by trucks a distance of 6 mi. from the plant to Cushing, where they are batched into other trucks for delivery to the job.

Wash water for the plant is pumped from Little Sioux River, about 300 ft. from the plant. The pump-house there contains an American Well Works 1,000-gal. per min. centrifugal pump which is driven by a 75-hp. Monarch gasoline engine. Sprays on the vibrating and revolving sizing screens provide sufficient water to wash the material thoroughly. A 60-hp. Waukesha gasoline engine drives conveyors No. 1 and 2, the scalping screen and the crusher by belt from a lineshaft. Another 60-hp. Waukesha gasoline engine drives the other two belt-conveyors and the revolving sizing screen by belt and the vibrating screen by chain. The screw-washer is run by a Cushman 10-hp. gasoline engine.

(*Continued on page 46*)

Nonmetallics of Great Commercial Value Cover Much of Oklahoma's Area

By CHARLES N. GOULD
Former Director, Oklahoma Geological Survey

THE greater part of the new mineral wealth of Oklahoma, which for a number of years has averaged $500,000,000, annually, has been derived from fuels and metallics. At the same time the state possesses vast stores of nonmetallic minerals, only a small part of which are being utilized. It is the purpose of this article to set forth in brief detail the location and approximate extent of these resources.

Stone of many kinds, both igneous and sedimentary, is widely distributed in Oklahoma. Granite, gabbro, porphyry and basalt are the chief varieties of igneous rock. Granite, which is most abundant, and most easily accessible, will be first discussed.

Granite.—There are three general areas in Oklahoma where granite occurs. There are very large amounts of granite in both the Arbuckle Mountains in southern Oklahoma and in the Wichita Mountains in the southwestern part of the state. A limited amount is found in the Ozark Mountains in the most northeasterly section of Oklahoma.

The largest area of granite in the Arbuckle Mountains is in northern Johnston County (Fig. 6). This region includes something over 100 sq. mi. of granite. The material is coarse-grained, pinkish to gray in color, and makes good building material. A quarry at Ten Acre Rock near Troy (Fig. 2) has furnished blocks for many buildings, including the basement of the State Capitol at Oklahoma City. Building and ornamental stones for various structures have been shipped from other quarries near Tishomingo and Wapanucka.

In northern Carter County, near the west end of the Arbuckle Mountains, there are two outcrops of porphyry (Fig. 1), known as the East Timbered Hills and the West Timbered Hills, but this material, being inaccessible to railroad, has never been developed.

Fig. 1. Turner Falls (on travertine), Arbuckle limestone in middle distance, porphyry hills in background.

The Wichita Mountains in southwestern Oklahoma consist largely of jagged peaks of granite projecting above the level plain which surrounds them. In size the Wichitas are very similar to the Arbuckles, being 60 to 70 mi. in length.

There are three kinds of igneous rocks in the Wichita Mountains. The greater part of the material is red granite. There are also extensive deposits of gabbro, a black crystalline rock, with associated black granite. In the vicinity of Fort Sill, near the eastern end of the mountains, the rocks are porphyry, very similar to the porphyry in the western part of the Arbuckle Mountains.

The igneous rock of the Wichita Mountains is used chiefly for monuments and a number of quarries producing this material have been in operation for many years. Gabbro is the chief material used, and blocks from these quarries, both in the rough and as the finished product, are shipped to many states. The Wichita Mountain gabbro takes a good polish, and is a superior stone for monumental purposes.

Pink and rose granite is also quarried for monuments and shipped to distant points. The greater part of the monument stone used in Oklahoma comes from quarries located at Roosevelt, Cold Springs, Granite and Mountain Park.

The Oklahoma Reformatory at Granite produces crushed stone, both for state institutions and for the general market. However, experience has shown that in a state abounding in high-grade limestone, more easily crushed, it is not usually profitable to attempt to crush granite for the trade. The wear and tear on machinery has usually rendered such attempts unsuccessful.

The Wichita Mountains alone contain amounts of granite so vast that for practicable purposes they may be considered inexhaustible. Granite for buildings, for monuments, for crushed rock and for all other uses to which the stone may be applied, is present in amounts which probably will never be completely used.

The third area of granite in Oklahoma is along Spavinaw Creek in northeastern Mayes County. At a point about 1 mi. below the dam which empounds Tulsa's water-supply there is an exposure of red granite about ½ mi. long.

The origin of this granite is not thoroughly understood. It was once thought to be a granite dike cutting overlying sedimentary rocks. but at

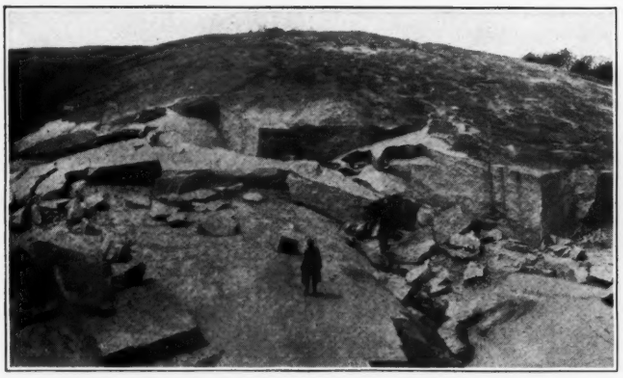


Fig. 2. Granite quarry at Ten Acre Rock.

Fig. 3. Basaltic lava on Black Mesa.

present many geologists consider it to be the top of a buried granite ridge now being uncovered by erosion.

This stone has been quarried at various times, and used both for building purposes and for road material. While the amount is not nearly as large as that of the granite in the Arbuckle or Wichita Mountains, there is enough at Spavinaw to last for local use for many generations.

The chief occurrence of basalt, or trap, in Oklahoma is on Black Mesa in the extreme northwestern part of the state (Fig. 3). At this place, during Tertiary times, a tongue of molten volcanic lava, 50 ft. thick and averaging ½ mi. wide, found its way down the valley of Cimarron River for a distance of 3 mi. into what is now Oklahoma. The lava hardened into rock. The river has since cut a new channel to the south, so that the lava now caps a hill 600 ft. high overlooking the valley. This is the highest point in Oklahoma, with an elevation of 4,978 ft. above sea level.

Limestone.—Limestone is widely distributed throughout Oklahoma, being found in all parts of the state except in certain of the central and northwestern counties (Fig. 6). For purposes of discussion, the limestones of Oklahoma may be divided into six general areas, as follows:

1. Pennsylvanian and Permian limestones in the northern part of the state.

2. Mississippian limestones in the Ozark Mountains of northeastern Oklahoma.

3. Wapanucka limestone in the east-central part.

Fig. 4. Quarry in Wapanucka limestone, Hartshorne, Oklahoma.

4. Cretaceous limestone north of Red River in the southeastern counties.

5. Heavy, massive limestones, aggregating more than 9,000 ft., in the Arbuckle Mountains.

6. The same heavy ledges exposed chiefly in a row of hills north of the main ridge of the Wichita Mountains.

The rocks of northern Oklahoma consist chiefly of alternating ledges of limestones and shales, with a few ledges of sandstone. On coming south the limestones gradually thin out and finally disappear. These ledges outcrop on the surface in a northeast-southwest direction. All dip west or slightly northwest and disappear under higher rocks. All these ledges have received geologic names. Beginning at the lowest ledge, the names of the more prominent ledges of limestone, in ascending order, are: Fort Scott (Oswego), Pawnee, Altamont, Oologah, Lenepah, Hogshooter-Lost City, Dewey, Avant, Pawhuska, Foraker, Neva, Cottonwood, Wreford, Florence-Fort Riley, Winfield, and Herington.

Numerous quarries have been opened in these ledges of limestone, mainly for supplying crushed stone, building stone and for the manufacture of Portland cement. It will be impracticable in an article of this length to name and locate any but a few of the most important of these various operations.

The Oologah limestone is being quarried along the St. Louis & San Francisco Railroad at Barnett, 12 mi. east of Tulsa, chiefly for crushed stone. Other quarries in this ledge are near Oologah. At Dewey the Dewey Portland Cement Co. quarries the Dewey limestone. At "Lost City" on the hills west of Tulsa, there are a number of quarries in the Lost City limestone. The Avant limestone has been extensively quarried at Avant, and the Pawhuska limestone—named in 1892 by Herbert Hoover, then a college student—has been worked for many years. The Ft. Riley has been quarried for railroad ballast at Uncas, and the Herington at Chilocco and Newkirk, mainly for building stone. The amount of available stone in this part of the state is inexhaustible, using the term in its relative sense.

A second area of limestone is located in that part of the Ozark Mountains lying east of Grand River. Here there are four principal limestones which have been utilized for commercial purposes. The best rock in the region is the St. Clair marble of Silurian

age, exposed near Marble City. Of this more will be said later.

The most abundant rock in this part of the Ozarks is the Boone chert—the so-called Mississippi lime of the oil man—which is exposed on the surface throughout considerable parts of Ottawa, Mayes, Delaware, Cherokee and Adair Counties. This ledge, which averages 300 ft. thick, is composed of limestone with large amounts of chert and flint, usually in the form of concretions. The basal member of the Boone, the St. Joe limestone, which usually is free from flint, is often used for building stone.

The Boone has been quarried at a number of places in Oklahoma and is used chiefly for crushed stone and ballast. Quarries have been located near Ft. Gibson, Tahlequah and Stilwell. The chats, which consist of refuse from the zinc mines at Miami, Commerce and Pitcher, Ottawa County, are composed very largely of Boone chert.

A third limestone in the Ozark region is the Pitkin, which is exposed chiefly on hills and cliffs along both sides of Grand River in Ottawa, Craig, Mayes, Delaware and Cherokee Counties. It is a heavy, bluish limestone, averaging 20 to 50 ft. thick. It has been quarried locally. Above the Pitkin lies the Morrow limestone, also quarried locally.

The Wapanucka limestone consists of a single ledge, averaging about 300 ft. thick, usually standing on edge, which outcrops along the northeastern periphery of the Arbuckle Mountains in Pontotoc, Coal and Atoka Counties, and along the northern margin of the Ouachita Mountains in Atoka, Pittsburg and Latimer Counties. It is hard and durable, and may be used for many purposes. At Limestone Gap it has been quarried for many years for ballast. At Hartshorne (Fig. 4) it furnished material for a cement mill. At Wapanucka it has been burned into lime, and near Bromide, where it

Fig. 5. Lime-rock quarry in Goodland limestone.

has an oölitic phase, it has been quarried for building stone, being very similar to the Bedford stone of Indiana. Outcropping as it does, for a distance of over 100 mi., this 300-ft. ledge of limestone is probably destined to play a prominent part in the commercial development of Oklahoma.

In the region along Red River, south of the Ouachita and Arbuckle Mountains, in the southeastern part of the state, there are extensive exposures of Cretaceous rocks, chiefly limestones, marls and shales. For the most part, the limestones are rather soft and not particularly good for building purposes or road material.

The most prominent ledge in this area is known by geologists as the Goodland limestone. It outcrops on the surface in a continuous line extending from Love and Carter Counties eastward, crossing Marshall, Johnston, Atoka, Bryan, Choctaw (Fig. 5) and McCurtain Counties, to the Arkansas line. The ledge averages 30 ft. thick. It has been quarried near Madill for building stone, at Ft. Towson for lime, and locally at various other points, chiefly for ballast and road material.

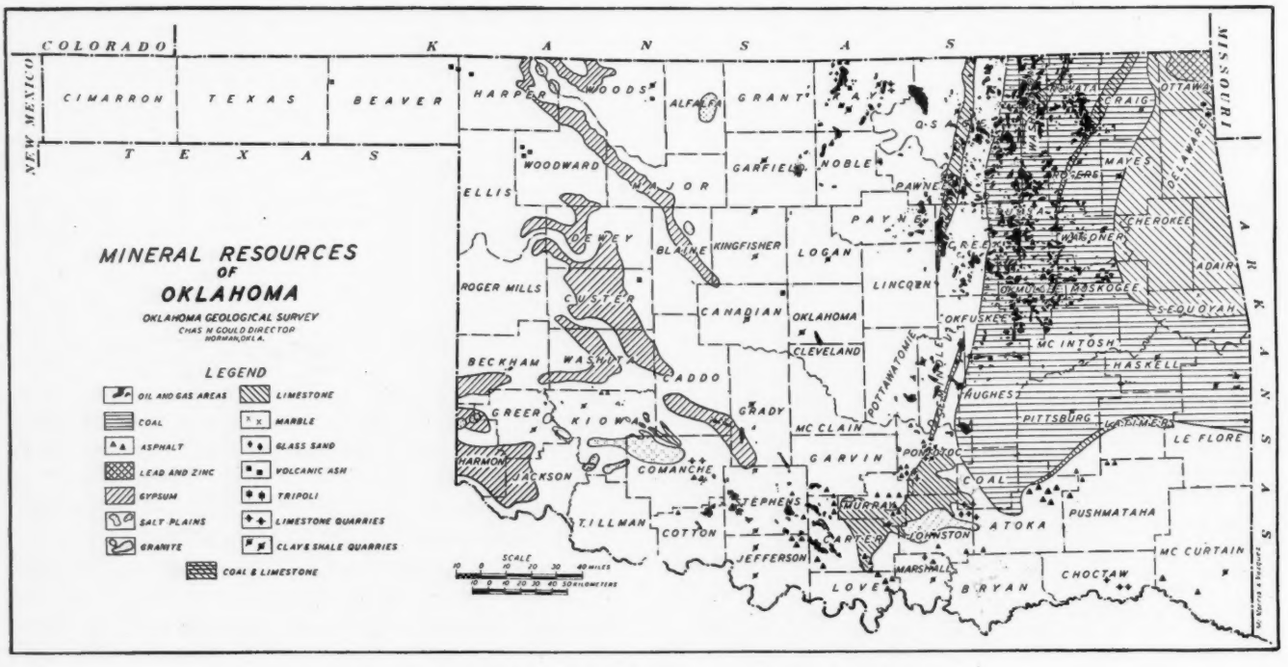


Fig. 6. The distribution of Oklahoma's nonmetallic-mineral resources.

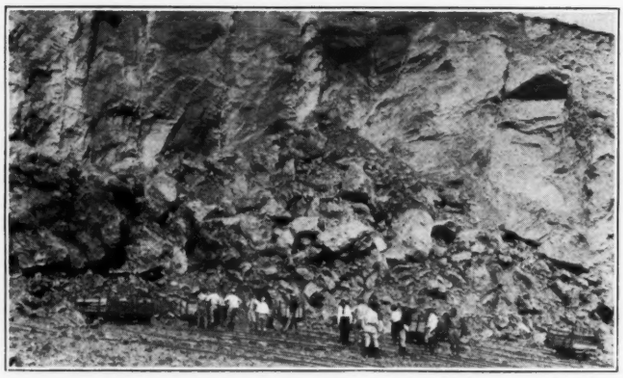


Fig. 7. Viola limestone used in cement making.

It is in the Arbuckle and Wichita Mountains that one finds both the most abundant, and the most available, limestone deposits in Oklahoma. Both stratigraphically and structurally, these two mountain ranges are very similar, consisting of elevated, truncated domes, some 60 mi. long, with cores of granite surrounded by flanked sedimentaries, chiefly limestones, averaging 12,000 ft. in thickness. The chief point of difference in the two mountain ranges is that in the Arbuckle this entire thickness of limestone and other sedimentaries is exposed to view, while in the Wichitas other rocks, chiefly Permian red beds, cover and obscure the greater part of the sedimentaries so that only the granite is now exposed on the surface.

The thickest and in many ways the most important ledge of limestone in the southwest is the Arbuckle limestone. This formation averages 8,000 ft. in thickness, being composed chiefly of beds of heavy, massive limestones and dolomites, with some shaly and sandy members in the upper part.

The Arbuckle limestone includes the great mass of the Arbuckle Mountains, being exposed mainly in Murray, Carter, Johnston and Pontotoc Counties. In the Wichita Mountains the Arbuckle limestone makes up the greater part of a ridge of limestone hills about 35 mi. long in southeastern Kiowa, southwestern Caddo and northern Comanche Counties. In all cases, the Arbuckle dips steeply to the north or south, away from the granite core of the mountains.

The Arbuckle limestone has been quarried at a number of places and is used chiefly for crushed stone. Large quarries are located in the Arbuckle Mountains at Crusher on the Santa Fe Railroad, 80 mi. south of Oklahoma City, and in the Wichita Mountains at Richards Spur, 12 mi. north of Lawton. A considerable part of the crushed stone used in construction work in Oklahoma City and in other cities in central and southwestern Oklahoma and northern Texas is obtained from these two quarries, which also supply a large amount of the stone being used for road metal in the same general region. Local quarries in the Arbuckle limestone are in operation in several places.

Above the Arbuckle limestone lies the Simpson formation which contains the glass-sand deposits of which more will be said later. The Simpson is succeeded by the Viola limestone, 600 ft. thick, a hard, dense, fine-grained limestone, usually standing on edge. The Viola is being quarried at Lawrence (Fig. 7) to furnish stone for the Oklahoma Portland-cement plant at Ada, at Bromide for crushed stone, and has been used for railroad ballast, road metal and lime from various local quarries.

Three other ledges of limestone—the Chimney Hill, the Bois d'Arc, and the Sycamore lying higher in the Arbuckle Mountain series are suitable for many purposes, but, on account of the greater abundance of stone in the Arbuckle and Viola limestones near at hand, have been quarried only locally.

Portland Cement.—There are two cement plants in operation in Oklahoma. The Dewey Portland Ce-

Fig. 8. Erosion forms in Purgatoire sandstone.

ment Co. plant at Dewey utilizes limestone from the Dewey limestone of Pennsylvanian age, located on the property. This limestone contains an admixture of shale, almost sufficient for the needs of manufacture, so that only a relatively small amount of shale must be added.

The Oklahoma Portland Cement Co. plant which is located at Ada, near the northern margin of the Arbuckle Mountains, uses limestone from the Viola and shale from the Sylvan, the next higher formation. These products are obtained from quarries (Fig. 7) at Lawrence, 6 mi. distant. The Ada plant employs both the wet and the dry method of cement manufacture.

A Portland-cement plant, which formerly was in operation at Hartshorne near McAlester, utilized limestone and shale from the Wapanucka.

A survey recently made in Oklahoma revealed more than 60 possible sites for future Portland-cement plants, of which some 6 or 8 were considered superior locations. This survey took into consideration the essential elements for the profitable manufacture of Portland cement, namely, quality and quantity of raw materials, fuel, transportation, the market, and the availability of labor. Much of the cement used in Oklahoma is produced in neighboring states. With the abundance of raw material, in addition to cheap fuel and a growing market, the opportunities would appear to be favorable for the profitable installation of additional cement plants in the state.

Lime.—So far as I am aware, no lime is being produced in Oklahoma. At various times during the past three decades small plants have been in operation in different parts of the state. At Ft. Towson the material was obtained from the Goodland limestone, at Bromide from the Viola, at Wapanucka from the Wapanucka, at Grove and Watts from the Boone, and at Pawhuska from the Pawhuska. Production of lime has been reported from 18 counties in Oklahoma. Chiefly on account of lack of either capital or experience, these projects have been abandoned.

There is an abundance of raw material for the production of lime. It has been proved that several of the ledges of limestone in the state will produce lime of very high quality. Particularly is this true of the Viola, Wapanucka and the basal part of the Boone. With the constantly growing market throughout the Southwest, there would seem to be an opportunity for the profitable operation of one or more lime plants in the state.

Marble.—Marble has been produced at one locality in Oklahoma, namely, at Marble City in northern Sequoyah County. The material is fine-grained, crystalline, grayish-white in color, and is known as the St. Clair marble. It takes a high polish and is in every way a superior building and ornamental stone. The quarries at this place were operated for some years. As an example of the character of this marble when used for building stone, may be cited the Pioneer Telephone Building at Oklahoma City.

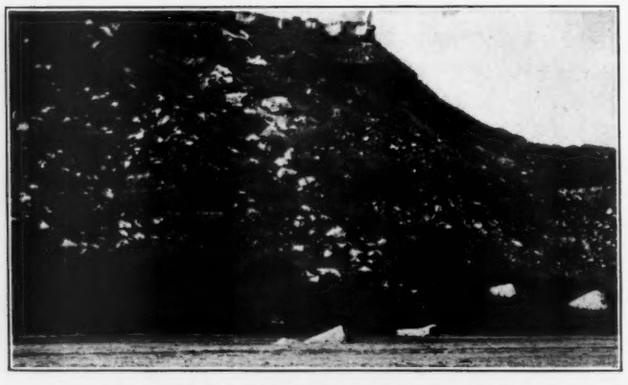


Fig. 9. Blocks of anhydrite in Gypsum Hills.

Sandstone.—Sandstone is found in practically every county in the state. In eastern Oklahoma it is chiefly gray to brown in color, while in the central and western counties the sandstone is red (Fig. 8).

In pioneer times sandstone was used extensively for building purposes. Business blocks still standing in practically every city and town were constructed of native sandstone, usually quarried near at hand. Farm houses and barns throughout the state were erected of local sandstone. Brick and concrete have largely taken the place of stone in building operations in Oklahoma, and at present very little sandstone is being quarried.

Gypsum.—Gypsum occurs in 23 of the 77 counties in Oklahoma, being confined very largely to the western part of the state. An estimate made some years ago indicated that the amount of gypsum in Oklahoma approximates 126,000,000,000 tons.

Gypsum in Oklahoma occurs in five different forms: rock gypsum, gypsite, selenite, satinspar, and as concretions. Of these, only rock gypsum and gypsite are commercial profitable.

By far the greater amount of Oklahoma gypsum occurs as rock gypsum. These beds of gypsum vary in thickness from a few inches up to more than 100 ft. The outcrops of these ledges occur chiefly in three general areas in Oklahoma, as follows:

The main line of Gypsum Hills extends from the Kansas line southeast for a distance of more than 100 mi. These hills are located mainly in Woods, Harper, Woodward, Major, Blaine (Fig. 9) and Canadian Counties. Throughout this distance the Gypsum Hills face east, standing out as a wall capped by a band of white gypsum. There are usually three ledges of gypsum, each averaging 8 to 20 ft. in thickness. The middle ledge, known as the Medicine Lodge gypsum, is in places a very pure, white anhydrite.

A second line of Gypsum Hills parallels the line just described at a distance of some 50 mi. west, being found for the most part in Dewey, Custer and Washita Counties. Ledges of solid gypsum more than 100 ft. thick occur near Cloud Chief.

A third region is in the southwestern part of the state in Harmon, Jackson, Greer and southern Beckham Counties.

Gypsite is the name usually given to the disintegrated, or earthy, form of gypsum. It occurs in pockets or beds usually along streams, or near the base of gypsum hills. Throughout the three regions just described in western Oklahoma there are known to be many deposits of gypsite. There are doubtless many others whose exact locations have never been discovered.

In an early day there were several small gypsum plants in operation in Oklahoma, some of which used gypsite, others rock gypsum. These were nearly all the old-fashioned kettle types of plants, manufacturing wall plaster only. For various reasons most of these plants have ceased operations. Several of them used gypsite as raw material and after a few years the pocket of gypsite became exhausted. Others lacked suitable transportation facilities.

Fig. 10. Glass-sand pit at Roff.

Fig. 11. Salt plain at Salina, once owned by Sam Houston.

Perhaps other causes contributed to the failure of other plants.

At present the largest gypsum plant in the state (owned by the U. S. Gypsum Co.), is located at Southard, Blaine County. Rock gypsum is the raw material used. Another plant is operating near El Dorado, Jackson County.

There are available sites in western Oklahoma for as many gypsum plants as will ever be installed. Formerly the problem of fuel was difficult to solve. Before the advent of natural gas coal was hauled from eastern Oklahoma, but now natural-gas lines thread western Oklahoma, and the fuel cost has been materially reduced. One may confidently expect to see additional gypsum plants in operation in the State.

Sand and Gravel.—Sand and gravel are perhaps more widely distributed in Oklahoma than any other kind of construction material. All the rivers in western Oklahoma carry vast amounts of sand. In fact, the beds of such streams as Arkansas, Salt Fork, Cimarron, North Canadian, South Canadian and Red, to mention only the larger ones, consist chiefly of sand. There are more Sand Creeks in the state than creeks with any other name. The flat uplands in many parts of western Oklahoma contain vast amounts of sand. There are strips or zones of sand hills, 2 to 15 mi. wide and sometimes 100 mi. long, along the north side of Salt Fork, Cimarron, North Canadian and South Canadian Rivers, so that the sand deposits for practical purposes are inexhaustible. In fact, we in Oklahoma often wish that there were not so much sand. We could well get along if the amount were much less.

Sand pits are working in many parts of the state. Nearly every large town has one or more pits from which sand is obtained for local use, and additional sand pits have been located at such places as Concho, Dover, Cleveland and Perkins, to mention only a few, where conditions, including transportation, are especially favorable for supplying more distant markets. In all of these places the hydraulic process of excavation is used.

While gravel is not so widely distributed as sand, the amount available is more than adequate for state needs. There are four general areas where gravel is especially abundant: in the three mountain regions—Ozark, Arbuckle and Wichita—and in certain scattered areas in western Oklahoma.

In the Ozark Mountain area of northeastern Oklahoma the gravel occurs chiefly along streams which rise on the Ozark Plateau and flow west into Grand River or south into Arkansas River. Some of the larger of these streams are Cowskin, Honey, Spavinaw, Spring, Illinois, Vian, Sallisaw and Lees. Some of the best of the gravel beds are found in terraces along the bottom land of Grand River below the point where a creek debouches into the valley, where it has dumped its load of accumulated gravel. Near Salina, for instance, a gravel bed in Grand River valley has yielded many hundreds of thousands of tons of gravel.

The greater part of the gravel from this region consists largely of flint and chert pebbles, the residue from erosion of the Boone chert. The limestone of the Boone has been dissolved and carried away by the action of water, leaving behind the siliceous chert, forming pebbles.

In the Arbuckle Mountains the gravel is chiefly of two kinds; either pebbles and small bowlders of limestone and chert, or disintegrated granite, usually known as arkose or granite wash.

The limestone gravel is found mainly in streams which have their source in a great mass of pebbly conglomerate found along the north slope of the mountains, which goes by the general name of Franks conglomerate. Geologists believe that during some former geological age this conglomerate was washed out of the mountains and deposited in great beds along their northern margin, where it is now found. The present-day streams are now at work tearing loose this conglomerate, carrying it downward and redepositing it in their beds as loose gravel. The largest gravel plant now working this material is near Dougherty, where gravel from Rock Creek is being loaded on cars.

The granite wash from the Arbuckle Mountains occurs largely in creeks which rise in the granite area of Johnston County and flow south. The largest of these streams are Mill, Rock, Pennington and Blue. Loose gravel in very large amounts is obtainable along each of these streams and in many of their smaller tributaries. Gravel of this character has been used for road metal under the trade name "Troy gravel."

In the Wichita Mountains conditions are somewhat similar to those just described. In the lime-

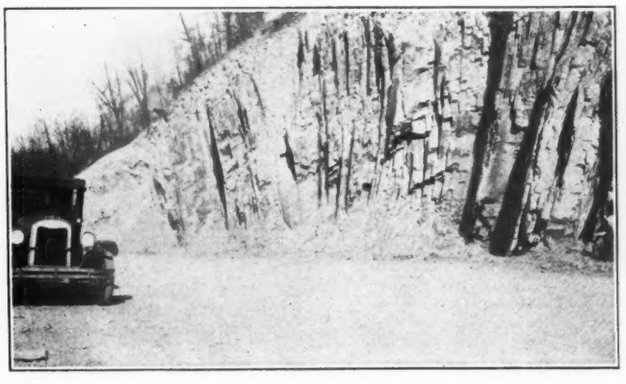


Fig. 12. Talihina chert near Stringtown.

stone hills north of the main granite ranges, there are deposits of limestone and chert gravel quite similar to that obtained from the Franks conglomerate. However, the most abundant material of the Wichita Mountains is the disintegrated granite, or granite wash, found in streams flowing from the mountains. Of these the most important are Medicine Bluff, Blue Beaver, West Cache, Post Oak and Otter. There are also beds of terrace gravels on the uplands between these streams and their tributaries, mainly south of the mountains, which have been used locally at Lawton, Snyder, Hobart and smaller towns in the region.

In western Oklahoma deposits of gravel are found rather widely disseminated and usually in no particular order. The surface rocks of this region are chiefly deposits of Tertiary age, consisting of clays, sands, gravel and marl, which are believed to have been derived from the outwash from the Rocky Mountains.

Gravel beds in this region are exposed mainly along bluffs and as terraces between streams and not, as a usual thing, in stream beds, which here are generally occupied by sand. One of the largest gravel beds of this character is at Red Point along the north bank of Beaver Creek, 12 mi. west of Guyman, Texas County. Another is on the upland south of Laverne, Harper County.

In many parts of Oklahoma there are local upland terraces composed of gravel. For instance, in Kay, Osage and Pawnee Counties in the northern part of the state gravels of this character, with pebbles composed of limestone and flint, would appear to have had their origin in the Flint Hills. In southeastern Oklahoma there are deposits of gravel of unknown origin, some of which are of workable size. Along the valleys of many of the streams of central Oklahoma gravel beds are found, the material usually having been derived from local ferruginous sandstones of the red beds.

In a gravel bed at Frederick, in southwestern Oklahoma, there have been found human artifacts, including metates, flint blades, in association with the bones of more than twenty species of extinct animals.

Glass Sand.—One of the valuable nonmetallic-mineral products of Oklahoma is glass sand. This material occurs in three general regions in the state: first, in various parts of the Arbuckle Mountains; second, along Illinois River near Tahlequah in the northeastern part of the state; and third, in the Trinity sandstone of southern Oklahoma. The principal source is certain ledges of sandstone in the eastern end of the Arbuckle Mountains.

The oldest glass-sand quarry in the state is located at Roff (Fig. 10), at which place sand has been taken out hydraulically for nearly 15 yr. The horizon is the Simpson formation. At Mill Creek the sand comes from the upper part of the Arbuckle limestone, and at Randolph the Trinity sand of Lower Cretaceous age is being drawn upon. An abandoned quarry at Hickory utilized sand from the Simpson. There are in Oklahoma sites for many more glass-sand quarries yet undeveloped.

Salt.—Salt has been manufactured in Oklahoma for many years. In western Oklahoma there are a number of salt plains with strong springs of salt water. The largest plain, located in Alfalfa County, has an area of more than 60 sq. mi. Eastern Oklahoma also has salt plains fed by springs of brine. One near Salina (Fig. 11) was once owned by Sam Houston.

Some salt is now being made by solar evaporation in northern Harmon County, and brine from deep wells is being made into salt and other chemicals at Sand Springs, but the greater part of the salt water is now going to waste, while Oklahoma housewives buy their table salt and ranchmen buy their stock salt from plants in Kansas and Texas. It has been estimated that there is enough unutilized salt water in Oklahoma to make 100 carloads of salt per day.

Chats.—For many years chats from the chat hills at the zinc mines in Ottawa County has been used for roads and, to a lesser extent, for concrete work. This material is inexpensive and the quantity available is very great but, on account of the fact that the stone is so finely broken, it is not in great demand.

At Stringtown a plant quarrying and crushing the Talihina chert has been in operation for several years. This material (Fig. 12) is used chiefly for railroad ballast and highway construction. The amount of raw material is very great.

Asphalt.—Oklahoma has large deposits of rock asphalt which has been used chiefly for surfacing roads and streets. This material occurs mainly in several counties in the southern part of the state.

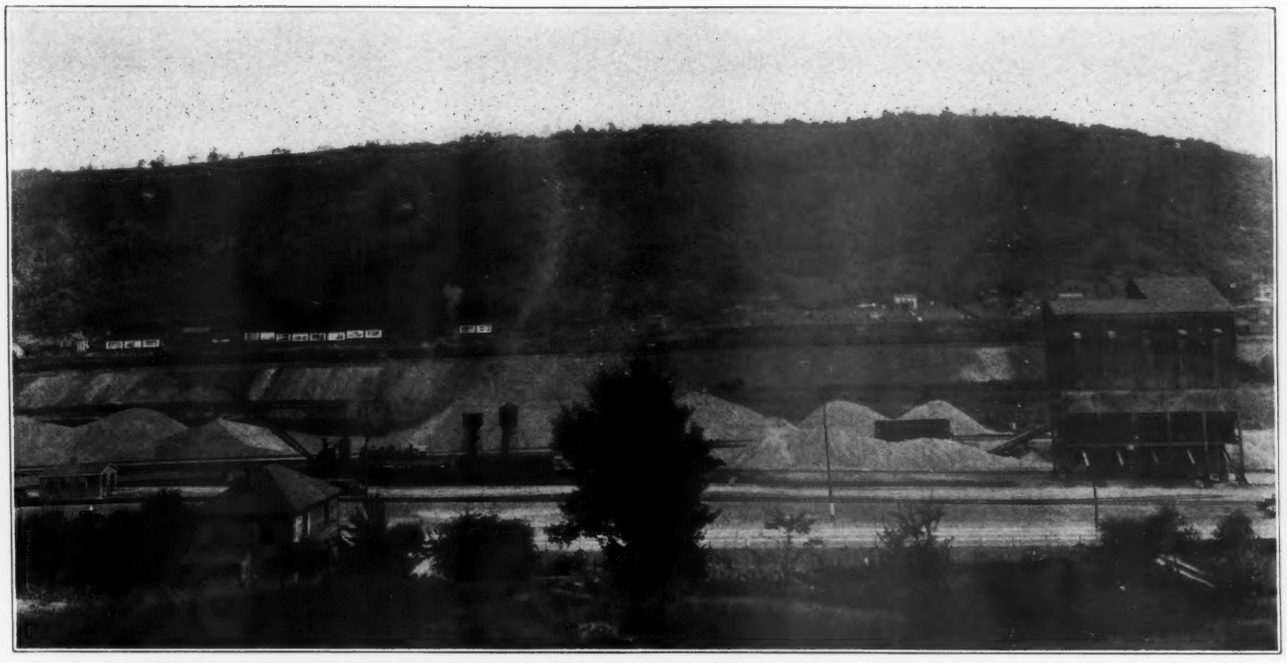
Sand asphalt consisting of ledges of sandstone impregnated with the liquid asphalt is most common. Usually these sandstone ledges are tilted at high angles, and the asphalt has worked its way to the surface along bedding planes. But in many cases the ledges lie level, and have been exposed by surface erosion of higher beds. There are also deposits of lime asphalt and shale asphalt. Frequently the asphalt has come up along fault lines. In the Ouachita Mountains mines produce pure grahamite with no admixture of rock, which looks much like anthracite coal.

Something like 50 asphalt mines and quarries have been opened in Oklahoma, but the greater part of them are now abandoned. Streets and roads paved with asphalt give good service, but since the advent of cheap residue from the oil refineries the use of native asphalt in Oklahoma has declined. The material is in the ground, and in time it will be developed.

Tripoli, Novaculite and Volcanic Ash.—In northeastern Oklahoma there are considerable deposits of tripoli, used chiefly for polishing powder and filters.

In McCurtain County there are extensive beds of novaculite, the same as the Ouachita whetstone rock. It is a hard, fine-grained sandstone and is used

(Continued on page 48)



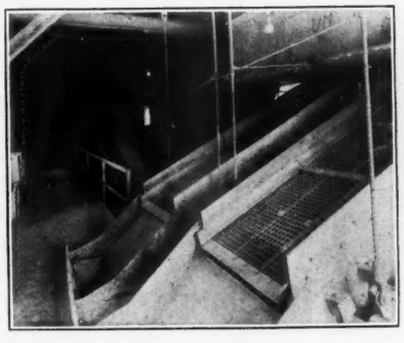
General view, showing plant and stock-piling facilities. Plant office with railroad and truck-scales at extreme left.

Slag Plant Has Equipment for Readily Loading Any Desired Mix or Size

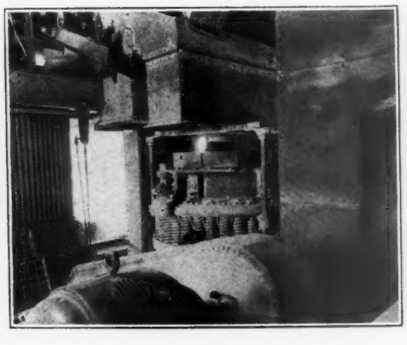
Chutes and Shuttle Conveyors Allow Cars and Trucks to Be Loaded Simultaneously

ONE of the most recent additions to the growing list of slag plants is that operated by the Standard Slag Co. at Hollidays Cove, W. Va. It is located on U. S. Highway No. 22 about midway between Weirton, W. Va., and Steubenville, O. This plant, which went into operation on July 6, 1931, is a compact operation in spite of its unusual flexibility. Its facilities for removing iron from its product and for crushing the slag to any desired size are also notable. Other features are the arrangement which allows any size or mixture of sizes to be loaded into cars or trucks and the permanent fireproof construction of the plant and miscellaneous buildings. An interesting sidelight is the fact that the plant is within sight of what is said to be the first blast-furnace ever built. During the War of 1812 cannon balls made there were used by the American forces in the famous naval battles on Lake Erie.

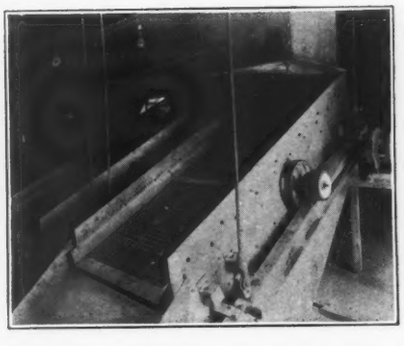
The raw material for the plant is air-cooled blast-furnace slag which is procured from the cooling pits of the Weirton Steel Co. plant at Weirton. There the slag is loaded into hopper-bottom railway cars and transported about 3 mi. to the slag plant. The cars are run on a refuse fill and discharge into a 2-compartment, 25 ton steel track-hopper. Two 42-in. Jeffrey reciprocating-plate feeders discharge the material from the hopper on a 42-in. Jeffrey 12-in. pitch steel-apron-conveyor, which operates



The two double-deck vibrating screens with belt-conveyor for fines in background.



The 4-ft. cone secondary crusher with its motor and drive in foreground.



Another view of the two sizing screens, showing v-belt drive and motor.

Train-load of slag ready to be dumped into track-hopper at plant. Note feeders and conveyor leading to plant at left.

Another view of steel loading bins, showing spouts for direct truck loading and belt-conveyor for loading single or mixed sizes into cars or trucks.

Locomotive "spotting" dump cars used to haul sized slag to stock-piles. Storage bins and plant in background.

on 98⅔-ft. centers at a speed of 72 ft. per min. This conveyor is horizontal alongside the track-hopper and then inclines at about 22½ deg. to the crusher building. As the slag passes along on the apron-conveyor, ladle sculls, bits of iron and other foreign matter are picked out by hand and thrown into an adjacent concrete bin. When enough of this material has been collected, it is loaded into cars by a locomotive crane for shipment back to the furnaces. To lay the dust raised in handling the slag it is sprayed as it is discharged from the feeders.

The apron-conveyor feeds the 5-ft. by 8-ft. Niagara single-deck scalping screen, which has 3½-in. manganese-steel wire cloth. The oversize is discharged into an Allis-Chalmers No. 7½ McCully gyratory crusher which reduces it to 2½-in. size and under and discharges it to the main belt-conveyor leading to the screening building. The material passing through the scalping screen is chuted directly to this belt-conveyor, which is 42 in. wide, operates on 117-ft. centers and is inclined at about 18½ deg. to the horizontal. A Cutler-Hammer 44-in. by 30-in.-diameter magnetic head-pulley removes any small particles of iron remaining in the slag and diverts them into a railway car on a spur track below.

The slag from the main belt-conveyor goes to a slag box, which feeds a 6-ft. by 8-ft. Niagara single-deck vibrating screen fitted with 2¼-in. manganese-steel wire cloth. The oversize is discharged into a 4-ft. Symons cone crusher which reduces it to 1½ in. and under. The material passing through this screen, together with the crusher product, is chuted to the boot of an inclosed vertical Jeffrey super-capacity chain-bucket-elevator which has 30-in. by 16-in. by 24-in. buckets. This operates on 78-ft. centers and discharges into a slag box which has a split chute leading to two 4-ft. by 10-ft. Niagara double-deck vibrating screens. The top decks of these screens have 1½-in. and the bottom decks 1-in. wire cloth. The material retained on each of the two decks is chuted to separate storage-bins. The material (1-in. minus) passing through the lower decks is discharged on a 30-in. inclined belt-conveyor operating on 55¾-ft. centers. This feeds a 6-ft. by 10-ft. Niagara double-deck vibrating screen which has ¾-in. and ¼-in. cloth on the top and bottom decks, respectively. The three sizes produced by this screen are chuted to separate bins.

The steel storage-bin supporting the screening building consists of five compartments for the five sizes of material produced, each compartment having a capacity of 100 tons. Each compartment has three bottom-discharge gates. Each of a set of five 20-in. gates feeds an individual chute which loads into trucks alongside the bins. Two 20-in. by 20-in. roller sliding gates under each compartment discharge to a 42-in. horizontal belt-conveyor under the bin for loading single or mixed sizes of slag into cars or trucks. This conveyor is reversible, operates on 56-ft. centers, and has a capacity of 675 tons per hr. The sliding gates are operated by hand-wheels and are calibrated so that any desired mixture is readily obtainable. With this arrangement cars and trucks can be loaded simultaneously.

The two reciprocating feeders which carry slag from track-hopper to the apron-conveyor leading to the plant.

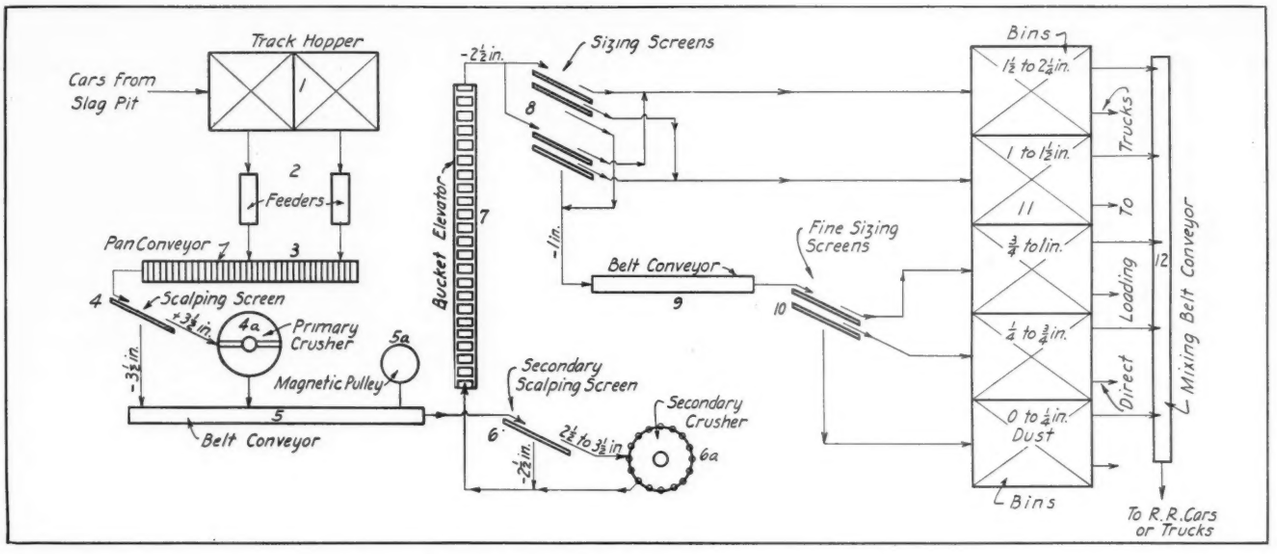
The plant office is near the plant. It is a one-story brick building with concrete basement and has a Fairbanks 240,000-lb. track-scale on one side and a

Howe 40,000-lb. truck-scale with a Weightograph attachment on the other side. All car and truck shipments are weighed on these scales. A short spur track connects the plant to the Pennsylvania R. R. and its proximity to Steubenville, Weirton, and other centers of consumption provides a large market which can best be reached by motor trucks.

When an excess of any size is produced, it is loaded into two 30-cu. yd. Western air-dump cars hauled by a 50-ton American saddle-tank steam locomotive which is also used for switching railroad cars. The slag dumped from the cars is rehandled to stock-piles by a 20-ton Ohio locomotive crane handling a 1½-cu. yd. Hayward clam-shell

(*Continued on page 48*)

Another view of loading bins, showing spouts for truck loading and shuttle belt-conveyor.



Flow-sheet of the Weirton, W. Va., plant of the Standard Slag Co.

TABULAR ANALYSIS OF THE OPERATIONS AND EQUIPMENT OF THE STANDARD SLAG CO., WEIRTON, W. VA.

(Key numbers refer to corresponding numbers on accompanying flow-sheet)

Operation	Key	Equipment	Make	Model No., Size, Capacity or Type	Power Source	Power Transmission
Unloading and primary scalping	1	Track-hopper		2-compartment, steel		
	2	Feeders (2)	Jeffrey	Reciprocating plate, 42-in., 200 ton per hr.	10-hp. Westinghouse motors (2)	
	3	Apron-conveyor	Jeffrey	42-in., 98⅔-ft. centers	25-hp. Wagner motor	Link-Belt speed-reducer
	4	Vibrating screen (Oversize to 4a, throughs to 5)	Niagara	5-ft. by 8-ft., single-deck	7½-hp. Westinghouse motor	V-belt
Primary crushing	4a	Gyratory crusher	Allis-Chalmers	McCully, No. 7½	75-hp. Wagner motor	Condor belt
Magnetic separation and secondary scalping	5	Belt-conveyor	Jeffrey	42-in., 117-ft. centers	20-hp. Westinghouse motor	Link-Belt speed-reducer
	5a	Magnetic pulley	Cutler-Hammer	44-in., 30-in. diameter		
	6	Vibrating screen (Oversize to 6a, throughs to 7)	Niagara	6-ft. by 8-ft., single-deck	7½-hp. Westinghouse motor	V-belt
Secondary crushing	6a	Cone crusher	Symons	4½-ft.	75-hp. Wagner motor	V-belt
Coarse sizing	7	Bucket-elevator	Jeffrey	78-ft. centers, 30-in. by 16-in. by 24-in. buckets	40-hp. Wagner motor	
	8	Vibrating screens (2) (Top-deck oversize to 1½-in. to 2¼-in. of 11; top-deck throughs to 1-in. to 1½-in. of 11; bottom-deck throughs to 9)	Niagara	4-ft. by 10-ft., double-deck		V-belt
Fine sizing	9	Belt-conveyor	Jeffrey	30-in., 55¾-ft. centers		Link-Belt speed-reducer
	10	Screen (Top-deck oversize to ¾-in. to 1-in. of 11; top-deck throughs to ¼-in. to ¾-in. of 11; bottom-deck throughs to 0 to ¼-in. of 11)	Niagara	6-ft. by 10-ft., double-deck		V-belt
Storage	11	Storage-bins (5)		Steel, each 100-ton		
Loading	12	Belt-conveyor	Jeffrey	42-in., 56-ft. centers, 675-ton per hr.		Link-Belt speed-reducer

Theoretical and Practical Developments in Portland-Cement Chemistry

Part V—The Problem of High Strength

By PROF. DR. HANS KÜHL
Director, Institute for Cement Research, Berlin

THE researches already described form the source from which to obtain the most successful results in the cement industry. First a decision must be made as to what line of technical development is going to lead to the ideal cement of the future.

The quality of cement has always been measured by its strength, since good hardening qualities—the most important requirement—find their best expression in strength values. The direction of past development was to commence with tensile tests, replacing these at a later date by crushing tests. The extent to which this change has already taken place varies considerably in different countries, and is least pronounced in England and America, where tensile strength still plays a great part in cement testing. The replacement of tensile by crushing tests was assisted by the general improvement in testing methods. It originated in the belief that crushing strength could be more accurately measured than tensile strength, while cement used for buildings was obviously more frequently subject to crushing than to tensile stress. It was not then foreseen that the time would come when the difference between comparing cements on the basis of crushing and of tensile strength would disappear. This, however, is the case at present.

First, however, it must be remembered that strength is not the only property of cement which is tested. Definite requirements must be met as regards setting time and soundness, which are also of great importance in evaluating the quality of cement. Good Portland cement must set slowly and harden rapidly. By the term "set slowly," it is understood that setting must not commence before 1 hr. to 2 hr. time has elapsed since mixing. Various materials capable of regulating the time of set are available, so that it is generally not difficult to produce Portland cement of the correct setting time.

The conditions as regards soundness are much more involved. According to the standard specifications of most countries, Portland cement is adequately sound when pats of 10-cm. to 12-cm. diameter, made up on glass plates, retain their sharp edges and remain undistorted and free from cracks after being stored for 28 days under water. Many countries have, however, specified other tests, the boiling test in particular being common, either in the form introduced by Michaelis or that employing the Le Chatelier callipers. There is, however, no country of note in which cement is not accepted as sound if it passes the 28-day cold-water test and the boiling test, and in addition fulfils the chemical requirements laid down for content of magnesia and sulphate.

In spite of these apparently definite requirements, which are fulfilled by almost all cements on the market today, it must be admitted that not a single cement exists that is truly sound in the strictest sense of the term. All cement structures are subject to expansion and shrinkage. This is inherent in our acceptance of the assumption that hardened cement consists of a shrunk gel, which of its nature must enter into equilibrium with the water vapor in the surrounding atmosphere. In practice this property is taken into consideration, and expansion joints are provided.

The forces that come into play in cement mortar are too many-sided for them to be attributed entirely to the phenomena of expansion and contraction. In the past few years Gensbaur's work on this subject has aroused a good deal of attention. He found that a considerable diminution in strength was caused by storing in water cement test pieces that had already been allowed to harden in air. Gensbaur's process, which he named Kl-storage, in honor of his town Kladno, is as follows: Tensile and crushing test pieces are first subjected for 28 days to the process of alternating water and air storage (viz., 1 day in moist storage, followed by 7 days under water and 21 days in air), after which they are stored a further 28 days in water and then tested for strength. He established that in a great number of cases the strength after these 56 days of treatment was considerably less than that at 28 days, and he attributes this fall in strength on Kl-storage to a concealed expansion, *i.e.*, an expansion that is not discovered by the usual soundness tests.

OBVIOUSLY the term "concealed expansion" will arouse contradictions, and at first sight it appears that there should be a more simple explanation for Gensbaur's observations. Dr. Haegermann, of the laboratory of the German Assn. of Portland Cement Manufacturers, has shown that, in the same way as cement test pieces, the majority of natural stones lose strength when, after previous drying in air, they are transferred to water, and that this applies even to dense natural rocks, such as limestone and granite.

The author has tested 25 Portland cements under widely different conditions as regards their response to alternating storage in air and water. Fig. 1 shows the typical strength curve of a cement on

Kl-storage. Both the tensile- and crushing-strength curves are drawn, the strength value being plotted as ordinate against the logarithm of the time of storage as abscissa. This logarithmic plotting is adopted with the object of conserving space. It is seen that both tensile and crushing strengths increase up to 28 days, after which, with renewed water storage, a fairly rapid fall in strength occurs. This strength reduction soon passes through a minimum value, so that at the end of a further 28 days (*i.e.*, a total of 56 days) a pronounced recovery is already evident. Thus, if Gensbaur had chosen a shorter testing period than 56 days (*e.g.*, 32 days), he would have obtained a much greater reduction of strength.

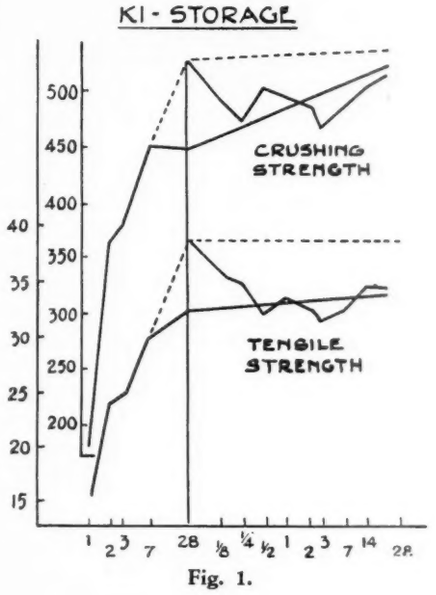


Fig. 1.

In addition to carrying out experiments on Gensbaur's method of storage, the author undertook a further series of tests in which cements were transferred every 3 to 7 days from water to air, or *vice versa*. Fig. 2 shows typical curves for these conditions of hardening, and it will be seen that the strength rises fairly regularly on transference to air, and as regularly falls during water storage. Such regularity in the course of the curve indicates that the changes in strength are due to physical causes. It is seldom, however, that a cement gives a symmetrical curve. With most cements considerable irregularities in the strength figures are found; indeed, in certain cases the phenomena are reversed and there is a reduction of strength in air and an increase in water. Such cases of irregularity during alternating hardening we must, with Gensbaur, seek to attribute to chemical causes which set up stresses in the interior of the cement, and it appears to be immaterial what name we give to these forces. In any case we can not tolerate the existence of such stresses in any cement that is to be accepted as especially good and adopted as the ideal; such a cement must give a normal curve on alternating storage.

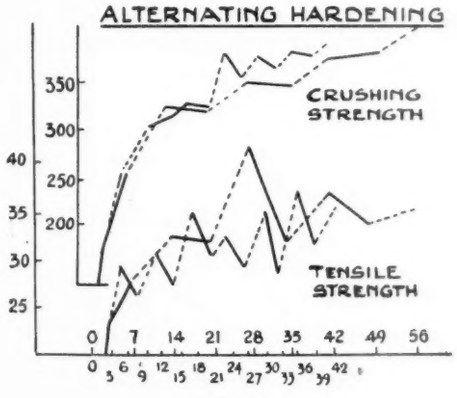


Fig. 2.

The phenomenon of retrogression of strength on alternating storage indicates the likelihood of a connection between irregularities during alternating hardening and an abnormal relation between the crushing and tensile strength of a sand mortar. It would appear that cements which show such irregularities lie dangerously near the region of expansion, and indeed in certain circumstances fall within it. We must, therefore, examine the chemical factors leading to expansion.

Serious cases of unsoundness of cement mortar are made evident by the cracking, swelling, and gradual disintegration of the hardened material. From this it was formerly deduced that unsoundness was due to increase in volume arising from the slaking of free lime, but the present author showed in 1910, by means of a simple experiment, that the "blowing" of cement is accompanied not by an increase in volume, but by a shrinkage of the mass, as is always the case in the normal hardening of a sound cement. If a flask is one-third filled with a mixed paste of unsound cement of the consistency of molasses, and is then carefully filled with water so as not to disturb the cement paste, as the cement in the lower portion of the flask sets and hardens contraction takes place, as is shown by the fact that the water level in the neck of the flask continually sinks; at the end of several days the flask usually breaks owing to the pressure exerted by the cement, and thus the experiment is brought to a close. It is remarkable that although the cement mass in the lower part of the flask contracts, it nevertheless exerts a pressure which results in the bursting of the vessel.

The chemical phenomena here belong to the realm of capillary chemistry. Without going deeply into this subject it may be pointed out that there is no basic difference between the volume relationships of cements subject to and free from expansion. The transition between unsound and sound cements is gradual, and there is no clearly-defined boundary between them. Thus, there can be no method of testing which unequivocally indicates whether a cement is sound or unsound.

It is known from experience that, when the lime content of a cement is increased, at first both tensile and crushing strengths also increase. At a certain value of the lime content, however, reduction in the tensile strength becomes evident, although the crushing strength continues to increase. On still further increasing the proportion of lime a lowering of the crushing strength finally occurs, and this appears to be the limit above which further increase in lime results in unsoundness. Thus, there is a definite connection between lime content, tensile strength, crushing strength, and tendency to unsoundness, and it is from this angle that the problem of improving the properties of cement must be studied. The high-strength cement of the future should be superior not only in one property but in

all its properties and, as has been shown, this can be attained by a very careful increase of the lime content.

IN Germany and most other countries today we distinguish between ordinary and high-strength Portland cements. The requirements as regards setting time and soundness are the same for both, but the strength requirements are much more stringent in the case of high-strength cement, in that high tensile and crushing strengths in the latter must be attained after a period of 3 days.

This conception of high-strength cements can only be regarded as a first step in the right direction, and in future a higher degree of soundness should be required of high-strength cements than for ordinary cements. It is not unlikely that the best measure of the soundness of cements will be found in the various strength relationships; for example, that between the tensile and crushing strengths of test pieces stored in water. It is, however, possible that the solution of the problem will be found in other directions, and that the anomalies observed on alternating air and water storage will play their part.

Returning now to the chemical considerations underlying the production of cement having the most desirable qualities, the correct choice of lime-content is always the most important consideration. When we clearly realize of what compounds our ideal cement is composed, the correct value for the lime content can easily be calculated. It has been pointed out that the most important constituents of clinker are alite and celite, and thus the problem resolves itself into so adjusting the lime content of the raw mix that during the burning process alite and celite are formed in the greatest possible quantities and, if possible, exclusively.

Having this decided upon the principle underlying the choice of lime content, we must inquire whether definite rules must also be followed to govern the proportions of silica, alumina, and iron oxide. In general, in the manufacture of cement, we tend to pay comparatively little attention to the composition of the clay; it is considered sufficient in most factories if the lime content of the raw mix is correctly adjusted. In actual fact any type of clay is capable of producing a high-strength cement, both in the present and the future sense of the term, provided (1) the clay and lime are mixed in the correct proportions; (2) care is taken in the preparation of the mix; (3) the burning is sufficiently intense; and (4) the clinker is ground very finely. These rules, which are apparently simple, are difficult to carry out, especially in factories not equipped with modern machinery. Such factories should give the utmost attention not only to the lime content, but also to the composition of the clay which composes the raw mix.

The quality of a cement is in no way dependent upon the absolute quantities of the various constituents, but is regulated by the relationships between them. Michaelis recognized this many years ago in presenting the hydraulic modulus, $\%CaO/(\%SiO_2 + \%Al_2O_3 + \%Fe_2O_3)$, to express the relationship between lime and clay substance. The present author at a later date introduced the silicate modulus, viz., $\%SiO_2/(\%Al_2O_3 + \%Fe_2O_3)$, and the iron modulus, $\%Al_2O_3/\%Fe_2O_3$. Let us now consider a series of cements, all of the same lime content but whose silicate modulus ranges from high to low values, *i. e.*, we pass from silica-rich cements to cements of low silica content, but correspondingly rich in alumina and iron. If all these cements are ground to the same fineness and tested under identical conditions, the highest strengths will be obtained from those at the ends of the silica-modulus series; the cements representing the middle of this series, on the other hand, will give somewhat lower strengths. In other words, the highest strengths are obtained from cements very rich in silica, on the one hand, and from those very low in silica, on the other.

THIS principle has found technical expression in two manufacturing processes for high-strength cements, one of which produces a cement rich in silica and the other a cement very low in silica. The first has a silicate modulus of 3 to 4; its silica content is thus 3 to 4 times as great as the combined quantities of alumina and iron. Cements of this type are not easy to produce, since the raw mix must be extremely finely ground and the burning must be intense. If, however, they are correctly manufactured, and the clinker is sufficiently finely ground, they have a very high initial strength, which must be attributed to their high content of tricalcium silicate. The cement of low silica content mentioned is diametrically opposite to the silica-rich cement first mentioned, in that its high initial strength is obviously due to its high alumina content, *i. e.*, to the presence of unusual quantities of calcium aluminates. It has long been known that aluminous cements have the property of extremely rapid hardening. It is also well known that they are unreliable as regards setting time, having a decided tendency to become quick setting. In the process evolved by the author, however, this danger has been overcome by increasing the iron-oxide content along with the alumina. As a result, the cement contains so little silica that the silicate modulus is only 1.2 to 1.4. The manufacture of the cement is relatively easy, since its lime content is not particularly high and it can be burned at a relatively low temperature. The only source of difficulty is due to the fact that the clinker readily becomes plastic, which tends toward caking in the shaft kiln and to the formation of clinker rings in the rotary kiln.

The immense importance of the conditions of clinkering as affecting quality is well illustrated by these two cements. Thus, the high-silica cement develops its superior properties only when it is intensively burned to a very dense clinker, while the author's cement, on the other hand, is very easily clinkered, even tending somewhat too readily to fusion, while again producing a dense clinker. It is probable, also, that the key to certain secret processes lies in the clinkering. Accordingly, all possible means of assisting clinkering should be adopted in the manufacture of high-strength ce-

ments, such as, for example, the use of fluxes, which are dealt with later.

RETURNING to the chemistry of clinkering, first it must again be emphasized that we are dealing with a partially-fused reaction system containing several phases, as already explained. Assuming that the clinker minerals are the products of reactions in the liquid phase, it is obvious that the reaction conditions will have a decisive influence upon the quality of the product, and careful consideration leads to the surprising conclusion that in certain cases a better cement should be obtained when the raw meal is not excessively finely ground. An extensive series of experimental burns has compelled me to agree that cases do occur in which a better cement is obtained when the raw meal is less finely ground. Theoretically, the best clinker will obviously be obtained when a correctly adjusted raw meal is ground as fine as possible. If, however, as readily happens in practice, the raw meal is not quite correctly adjusted, but is, for example, kept a little low in lime as a matter of precaution, a better cement will be obtained from a less finely ground raw meal.

Taking a raw meal on the average a little too low in lime, with the finest grinding a clinker results which is also generally low in lime, as a result of which the resulting cement suffers in strength. If, however, such a raw meal be less finely ground, the clinker is enriched in lime at all points at which coarser grains of lime occur, while the intermediate portions are even lower in lime than the average of the mix. We thus obtain with the coarser grinding a clinker whose composition varies from point to point. The portions rich in lime, which approximate the ideal composition, possess much greater hardening properties than a homogeneous clinker prepared from the same raw mix more finely ground. On the other hand, the particles of the heterogeneous clinker which are low in lime have feebler hardening properties than the homogeneous clinker. Since, however, the influence of the portion of correct lime content is much the greater, the resulting cement will develop a higher strength than one too low in lime throughout. This is the key to the fact that a raw meal somewhat low in lime will actually give a better cement when it is not excessively finely ground.

As already pointed out, perfect clinkering is of outstanding importance for the production of a good cement. At the same time the length of burning and the speed of cooling appear to have important effects. Extensive investigations indicate that rapid cooling improves the hardening properties of clinker. The factors which come into play in this connection are similar to those which exert such an important influence in the granulation of blast-furnace slags. While slowly-cooled slags are practically inactive, the same slags have pronounced pozzuolanic properties when rapidly cooled, which enable them to be used as the raw materials for iron-Portland and blast-furnace cements. On very rapid cooling, so that the molten slag has no time to crystallize but solidifies as a glass, a condition of non-equilibrium is perpetuated. The slags in this condition possess a much greater chemical potential than slowly-cooled crystallized slags, and to this must be attributed their increased reactivity with water and their resulting importance as hydraulic materials. Exactly the same principles underlie the cooling of clinker, although in this case they are not so pronounced.

In the subsequent grinding a number of factors must receive attention if the resulting cement is to be of the best possible quality. These factors are for the most part of a purely technical nature, and will be considered later. The reduction of setting time which results from increasing the fineness of grinding of a cement clinker is almost self-explanatory, since the total surface of the cement particles continuously increases as the material is more and more finely ground, and an increase in the reactivity with water and in the speed of reaction naturally follows. It is noteworthy, however, that in the case of almost all cements this reduction of setting time is suddenly accelerated on attaining a certain degree of fineness, at which point the cement, hitherto slow-setting, suddenly becomes quick-setting. For example, as the fineness regularly increases, the initial setting may gradually decrease from 4 hr. to 2 hr., after which only a very slight further increase in fineness will be sufficient suddenly to reduce this value to a few minutes.

A VERY similar phenomenon occurs on adding gypsum to regulate the setting time. In investigating the effect of gypsum of different degrees of fineness, Brans found first that the action of gypsum increased the more finely it was ground. Apart from this, he found that on reaching a certain percentage addition a pronounced retardation of setting time suddenly occurred. The percentage addition at which this accelerated influence becomes evident is higher according as the gypsum is coarser. It will be seen from the accompanying tables, which are extracted from the work of Brans, that a slight increase in the percentage of gypsum is sufficient to transform a quick-setting to a slow-setting cement. This is a case of a suddenly accelerated action that must be closely allied to the sudden change in setting time resulting from increasing the fineness of cement. In both these cases we are dealing with a surface reaction, which indicates that an explanation of the connection between

INFLUENCE OF GYPSUM ON INITIAL SETTING TIME

	Gypsum Ground:							
	Very Coarse		Coarse		Medium Fine		Fine	
Percentage of gypsum	21.5	25.8	17.2	19.4	10.8	11.8	2.7	3.8
Initial set (*min.*)	5	400	6	300	4	210	5	118

INFLUENCE OF GYPSUM ON FINAL SETTING TIME

	Gypsum Ground:							
	Very Coarse		Coarse		Med. Fine		Fine	
Percentage of gypsum	12.9	14.0	10.2	10.8	4.8	5.3	1.6	2.2
Setting time (*min.*)	20	135	25	210	15	138	25	190

the two phenomena must be sought in the realm of colloid chemistry.

A consideration of the chemical basis for the further development of Portland cement would be incomplete without discussing the catalytic action of the various materials added during the grinding of the clinker for the purpose of increasing its reactivity. It is well known that gypsum not only retards the set but also increases the strength of cement, while other sulphates act in the same way. Innumerable other substances have been tested to determine whether they assist the initial hardening of cement, and calcium chloride has been found particularly effective since, in small quantities, it causes a pronounced increase in strength. Unfortunately, however, it has the undesirable property that, in greater quantities, it seriously lowers the setting time, and can thus only be added with great caution.

The author has attempted to make it possible to introduce somewhat greater quantities of calcium chloride by replacing this compound by other chlorine compounds which give rise to calcium chloride on hydrolysis or other chemical action with the mixing water. For scientific reasons the author included in these experiments chlorine compounds that it would be impossible to consider from the practical point of view, such as chloroform, chloral hydrate, carbon tetrachloride and trichloracetic acid. These experiments had no decisive result, however, since the formation of calcium chloride was either too rapid or too slow, so that either the cement became quick-setting or the anticipated increase in strength was not obtained.

Later a comprehensive investigation was carried out into the catalytic effect of all possible cations and anions upon the strength. The results obtained with cations can be briefly summarized as follows:

Small additions of the following resulted in increased strength: Lithium, sodium, potassium, ammonium, calcium, strontium, barium, cadmium, aluminum, and iron as chloride.

Without pronounced effect were magnesium, chromium, nickel, cobalt, and iron as chlorate.

Reduced strength resulted from manganese and tin, and especially from zinc and copper.

Lead was definitely injurious.

To generalize, the metals of low atomic weight exerted a favorable action, and those of high atomic weight a deleterious action.

The effect of the anions was less definite, and is not discussed here except to mention a single striking observation, viz., an increase in the 1-day crushing strength from 825 to 3384 lb. per sq. in. due to an addition of 2 per cent. calcium bromide. Obviously, the great increase in strength is to be attributed to the influence of bromine. This question has not been followed up, since, for economical reasons, bromine could never be commonly used in the cement industry.

In the present state of knowledge, apart from the technical perfection of cement manufacture, the key to new advances in the cement industry lies in the correct adjustment of the raw mix as regards lime, silica, alumina and iron oxide. This summarizes the chemical aspect of the problem, and in the next part we deal with its technical solution.

Robbins, Young

(Continued from page 31)

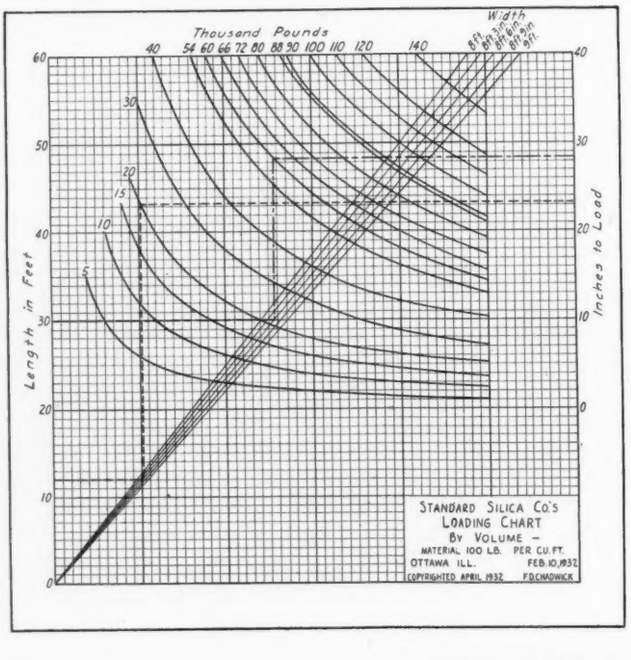
The electric lights which provide illumination for night operation of the plant are supplied with current by a small Delco-Lite unit. The shovel has its own electric lights, and a few acetylene flares are also used. The Link-Belt Co. furnished the conveyor idlers and pulleys and the drive chains and sprockets. Manhattan conveyor belting and Twin City screen cloth are used exclusively.

The company's officers are: Charles H. Young, president and general manager; H. M. Robbins, vice-president and treasurer; H. D. Robbins, secretary. C. O. Granger is superintendent of the Correctionville plant.

Convenient Chart Shows How to Load Cars Easily and Quickly

The Standard Silica Co., Ottawa, Ill., has devised a means of loading cars at one of its plants where there are no railroad scales. Often cars are loaded with two classes of material in the same car, these being separated by a partition. A curve, worked out by F. D. Chadwick, general manager of the company, allows these cars to be loaded accurately with the desired quantities of material.

The accompanying chart can be used for cars up to 60 ft. in length and of widths of from 8 to 9 ft. Knowing these two dimensions, the depth to which the car is to be loaded for any desired quantity of material is readily found. For example, assume that a car 42 ft. long by 8½ ft. wide is to be divided into lengths of 12 ft. and 30 ft. with 20,000 lb. in the former length and 60,000 lb. in the latter. The material to be loaded weighs 100 lb. per cu. ft. The dotted line in the chart shows how this is worked out. The depths of loading in this case are found to be 23¼ in. and 28¼ in., respectively. This method has been used for some months and has been found very satisfactory.



Portable Plants Big Competitive Weapon for Permanent-Plant Operators

Produce Specification Material at Less Cost Than Commercial Plants

By W. CORNWELL
Engineer, Austin-Western Road Machinery Co.

THE unsettled economic conditions that have obtained through the past months have left their mark on all branches of industry, and the problem of survival in the face of lower prices, curtailed buying, less construction, etc., has been a serious one to most concerns. It goes without saying that those that have weathered the storm are the ones whose managements have taken advantage of every possible item to keep their costs down to a point where they can secure some of the business that is still being done and make a small profit at the same time.

There is no industry to which the above remarks apply more pertinently than to the production and use of stone and sand and gravel for construction work of all kinds. The reason is simple. The contractor who must make up a bid to be submitted in competition with others, the price of which is built up from a number of separate units, can be expected to scrutinize each one of these most carefully, and the cost of his sand-and-gravel aggregates, which bulks large in his figures, most naturally receives very serious consideration. If he can work out a way to reduce this cost, it is certain that he will do so.

That many contractors have discovered a means for reducing their aggregate costs is evidenced by their ever-increasing decisions to purchase portable crushing and screening equipment for use in gravel and stone deposits along the right of way or in the immediate proximity of the job under construction, rather than to buy the aggregates of the commercial plant as so many have done in the past.

As one very large item in the cost of materials produced by the commercial plant has always been the freight that must be paid for moving them from the point of production to the points of use, utilization of local deposits enables the contractor to save this appreciable sum and that certainly justifies his interest in portable equipment that allows local production. The tremendous strides made during recent years by manufacturers of portable crushing and screening equipment in the development of their products have made it possible for the contractor to compete in production cost with the commercial plant. From the standpoint of the commercial-plant owner, who has large sums of money invested in stationary equipment, this inroad into his business has been a serious thing; and in the cases of those who depend upon the building contractor for the disposal of the majority of their products, it calls for some immediate, drastic change in policy if they, too, are to survive.

There seems to be only one logical way that this can be done and that is to lower the cost of production to a point where the commercial producer can compete with the privately-owned portable-plant unit. The situation as a whole is very similar to the position of the railroads, which are in competition with motor trucks and 'buses for freight and passenger transportation. Their method of meeting that competition should be a hint to the commercial-plant owners as to the proper solution in his case. The railroads have started 'bus lines of their own; as long as people want to travel by 'bus, the railroads will run the 'buses. The inference is plain. If it is cheaper to produce stone and gravel in local pits and quarries, using portable plants with which to do it, then the commercial-plant owner will wisely supplement his large stationary installations with quick-moving, flexible, efficient portable installations that will enable him to go into any locality and produce materials from local pits or quarries for less than the contractor could do it himself. The commercial-pit owner has a big advantage over the contractor in this regard, too, because the cost of a portable crushing and screening plant runs into a fair amount of money and, with his experience and knowledge of correct operating methods, he should be able to handle such a plant on a much more efficient basis than the contractor, who in most cases is buying one for the first time and knows practically nothing about its operation. The plant owner who is equipped with an efficient stationary installation and one or two efficient, fast-moving, portable plants will be ready to take on any class of competition in the area in which he operates.

As time goes on the engineers responsible for our road and building specifications improve their ideas and where there used to be a demand for comparatively large-sized gravel and stone, we now find a very considerable demand for aggregates reduced to a maximum of ¾ in. and even less. Any one with a knowledge of the subject knows that it is an entirely different problem to crush to 1½-in. or 2-in. and to reduce to ¾-in. A machine that would be perfectly satisfactory for the larger sizes will not do at all for the smaller. Coupled with this demand for fine sizes is the need for larger quantities and, to the manufacturer of crushing and screening equipment, this combination of needs has presented major problems. However, there are a number of efficient portable plants now offered by equipment manufacturers that satisfactorily meet the need for the production of both gravel and stone aggregates

and in daily capacities sufficiently large to make it possible for the ultimate user to work his full crew without loss of time.

The building of a portable washing plant has been even a more serious problem for the equipment manufacturer than that of providing a crushing and screening plant because of the different problems involved and the need for space in which to complete the washing and separating operations. But these obstacles have been overcome and there are now on the market portable washing plants that combine in a very limited space the ability to separate thoroughly and to wash large quantities of aggregate, separating the finished product into various sizes and depositing them in stock-piles, bins, etc., as desired by the user. When one visualizes the amount of equipment that is sometimes used in the stationary plant for the production of 600 or 700 cu.yd. of washed material per day, it is hard to realize that one can buy a portable unit which weighs less than 30,000 lb. and will accept, classify and thoroughly wash up to 1,000 tons per day of 10 hr., and that this whole unit is mounted on one set of trucks and can be installed on very short notice in any roadside pit.

It is machinery of modern design that is awakening the users of these materials to the fact that they can perhaps produce their own aggregates just as well as buy them of the central plant and pay the freight charges and profits that would necessarily be included in their price. And it behooves the commercial-plant owner to consider not only the portable crushing and screening plant but also portable washing equipment, for by so doing he puts himself in a position to compete at all times with the user himself, thereby saving the business that is gradually getting away from him. As the use of these portable plants increases and more and more people discover that they can operate them successfully, the commercial-plant owner is going to find the problem of survival more and more difficult unless he realizes before it is too late the need for getting into this portable work himself.

Standard Slag *(Continued from pag 41)*

bucket. This crane also loads from the stock-piles to railroad cars for shipment.

The plant was designed and its construction was supervised by the engineering department of the Standard Slag Co. and is the result of many years of experience in building and operating slag plants. The plant has capacity to produce 200 tons per hr. This capacity is obtained with a force of 9 men in addition to the superintendent, clerk and night watchman. The plant buildings have structural-steel framework on concrete foundations and corrugated-metal siding and roofing. On the property are also blacksmith and repair shops which are of the same type of construction. These are equipped to make any minor repairs.

Power is supplied from the lines of the Monongahela-West Penn Public Service Co. at 2,300 v. to a substation at the plant which reduces it to 440 v. for all motors. Westinghouse motors are used to drive all the equipment except the two crushers, which are driven by Wagner motors.

The drive of the No. 7½ Crusher is accomplished by means of a 16-in. Condor endless belt made by the Manhattan Rubber Mfg. Co. The screen drives as well as the Symons crusher drive are V-belts. The other drives are Link-Belt silent chains with Link-Belt speed-reducers.

The five vibrating screens, which do all the sizing and scalping, were furnished by the Niagara Concrete Mixer Co. The Jeffrey Mfg. Co. furnished the remainder of the equipment, except for the crushers. The Ohio Structural Steel Co. furnished and fabricated the structural-steel building, shop building and track-hopper. The Hunter Construction Co. erected all the steel work and corrugated-metal siding and roofing. The machinery was installed by the Standard Slag Co., and the electric equipment by the Weirton Steel Co.

The main office of the Standard Slag Co. is in the City Bank Bldg., Youngstown, O. The officers of the firm are: L. A. Beeghly, president; W. E. Bliss, vice-president; W. H. Kilcawley, secretary and treasurer; R. D. Cline, purchasing agent; C. E. Leach, chief engineer. K. H. Durbin is plant superintendent working under the supervision of District Superintendent C. E. Rinehart, with offices in the Steubenville Bank & Trust Bldg., Steubenville, O.

Oklahoma *(Continued from page 38)*

chiefly for hones, jeweler's stones, and other hard abrasives.

Volcanic ash is found in many places throughout the state, and has been quarried at a number of localities. It is used for scouring and polishing compounds. At present it is being worked at Gate.

Production.—During the last 10 yr. the average annual production of gypsum in Oklahoma has been approximately 325,000 tons, valued at $2,035,000. The production of sand and gravel has averaged 1,606,000 tons, valued at $1,164,000, and of stone, 1,602,000 tons, valued at $1,513,000. The average value of miscellaneous minerals, chiefly Portland cement, during this decade has been $5,271,000. The total value of the nonmetallics has averaged approximately $10,000,000 each year. This amount may appear to be rather small when compared to the average of $345,000,000 derived each year from petroleum, $78,000,000 for natural gas and natural-gas gasoline, and $29,000,000 from zinc.

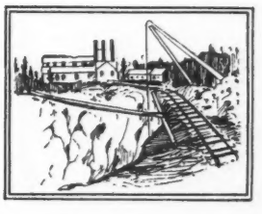
However, one should not be unmindful of the fact that both the hydrocarbons and the metallics are being exhausted rather rapidly. Oklahoma's 350 oil and gas fields are being drawn upon too rapidly. Her coal—estimated by the U. S. Geological Survey at 79,000,000,000 tons—will probably last long after the oil and gas are gone.

It is a comforting thought that with the array of nonmetallics described in this article, combined with the abundant reserves of fuel, Oklahoma, as the years go on, will doubtless become the site of many quarries, plants and factories which will utilize her raw materials.

MEN OF THE INDUSTRY

JOHN J. PORTER

MR. PORTER is the newly-elected president of the North American Cement Corp., of Albany, N. Y., succeeding the late Frederick W. Kelley, who died September 19. Mr. Porter has been vice-president and general manager of the North American concern since its organization in 1925 which resulted from the merger of the old Helderberg Cement Co. and the Security Cement & Lime Co. He will make his headquarters at the New York offices of the company which are at 285 Madison Avenue.



Personal Mention

E. L. Coppock, vice-president and assistant manager of the Nephi Plaster & Manufacturing Co. of Salt Lake City, Utah, has been elected president and general manager of the company, succeeding the late **Dr. W. L. Ellerbeck.** Mr. Coppock, heretofore also assistant manager of the Utah Lime & Stone Co., another organization of which Dr. Ellerbeck was president and general manager, has been chosen as general manager. It was stated that a new president for the lime and stone company has not been elected yet.

D. D. Wilson was recently made works manager of the East Chicago plant of the United States Gypsum Co. He was formerly works manager of the Detroit, Mich., plant. Mr. Wilson takes the place of Ned Hill who held the position for the past two years. Mr. Hill has taken Mr. Wilson's place at Detroit. The transfer is in line with the company's policy of familiarizing its executives with all the operating departments of the company.

Cordon Van Aiken, formerly engineer of the Universal Atlas Portland Cement Co's. plant at Buffington, Ind., was recently appointed city engineer of Crown Point, Ind., under a 3-year contract. Mr. Van Aiken plans to move his family to Crown Point in the near future.

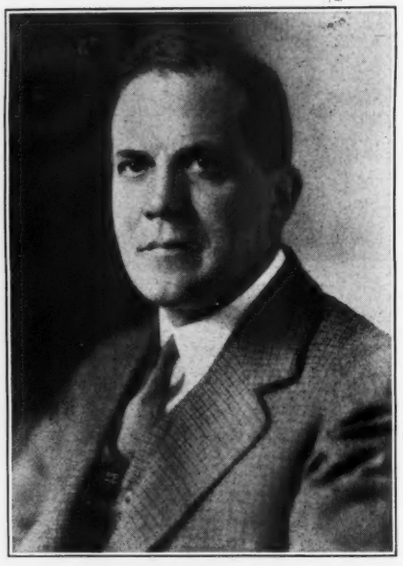
Glenn E. Weist, formerly sales engineer with the Milwaukee Electric Hoist Division of the Harnischfeger Co., Milwaukee, has joined the Kron Co., Bridgeport, Conn., manufacturer of automatic dial scales for all industrial uses. Mr. Weist is in charge of engineering. He is a graduate of Purdue University and has had wide experience in the engineering field.

Carl S. Wagner has been appointed general sales manager of the National Equipment Corp., according to a recent announcement. Mr. Wagner was graduated from the University of Michigan in 1907 and has since that time been actively connected with the construction industries.

Ward Kief, former construction and products engineer for the Portland Cement Assn. in the Seattle, Wash., territory, is manager of the Oregon Concrete Pipe Co., of that city. This company was recently formed to stock a complete line of concrete sewer and culvert pipe and is owned by a group of concrete-pipe manufacturers.

Woodson Tucker, Jr., chemist for the Superior Earth Co., Ocala, Fla., was married on Oct. 8 to Miss Lillian Stewart of the same city.

Chauncey Nichols, sales manager for the Oklahoma Portland Cement Co., with offices at Oklahoma City, Okla., was recently appointed state campaign chairman in a statewide "share the work" campaign. The purpose of this campaign is to urge the temporary use of a 4- or 5-day week in order to spread the available work as far as possible.



Elbert E. Haight

Obituary

Elbert E. Haight, 53, president and business manager of the Concrete Publishing Co., Chicago, passed away Oct. 15, at St. Francis Hospital, Evanston, Ill., following an illness of several months from complications resulting from an attack of pneumonia.

Mr. Haight was widely known in business-paper circles, having been western manager of the Class Journal Co. for eighteen years prior to 1925. In that organization he was most closely identified with the publication *Motor Age,* on which he served as business manager. For a number of years he served on the executive committee of the Associated Business Papers, Inc. In 1925 he organized his own company, the Concrete Publishing Co., publishers of *Concrete* and the Cement Mill edition of *Concrete,* which up to that time had been published in Detroit. In this organization he served as president and business manager. Mr. Haight graduated from the University of Michigan in 1900, and was a member of Glencoe Lodge A. F. & A. M.

Coming Events

December 1-2, 1932. Washington, D. C. Twelfth annual meeting, Highway Research Board. Under auspices of National Academy of Sciences and National Research Council, 2101 Constitution Ave.

December 4-9, 1933. New York, N. Y. Fourteenth Exposition of Chemical Industries. Under management of International Exposition Co., Grand Central Palace, New York.

December 5-9, 1932. New Orleans, La. Tenth Annual Asphalt Paving Conference and annual meeting, Assn. of Asphalt Paving Technologists. Under auspices of Asphalt Institute, 801 Second Ave., N. Y.

December 5-10, 1932. New York, N. Y. Tenth National Exposition of Power and Mechanical Engineering. Under management of International Exposition Co., Grand Central Palace. New York, N. Y.

December 7-9, 1932. Washington, D. C. Annual meeting, American Institute of Chemical Engineers.

Jan. 16-20, 1933. Detroit, Mich. Highway and Building Congress. Annual Conventions and Combined Show of National Crushed Stone Assn. (Jan. 16-18), National Sand & Gravel Assn. (Jan. 17-18), and National Ready-Mixed Concrete Assn. (Jan. 18), Book-Cadillac Hotel.

February 20-23, 1933, Chicago, Ill. Twenty-ninth annual convention, American Concrete Institute. Harvey Whipple, secretary, 2970 W. Grand Blvd., Detroit, Mich.

Traffic News and Comment

Recent I.C.C. Decisions

Agricultural Limestone.—The commission has found not justified the proposed reduced rates on agricultural or refuse lime and agricultural limestone from Mosher and Ste. Genevieve, Mo., to destinations in Illinois on the Missouri-Illinois R.R. This finding is without prejudice to the establishment of rates on agricultural limestone, in open-top cars: of 73 c. a net ton from Mosher to destinations as far north as Nashville, Ill., and of 76 c. to destinations as far north of Nashville as Centralia, Ill. The findings in I. & S. No. 3,604, 181 I.C.C. 373, have been modified to permit the establishment of the rates authorized in this report, which rates are permitted to become effective on one day's notice. The suspended schedules are to be cancelled not later than Jan. 22, and the proceeding discontinued.—I. & S. Docket No. 3,768, Agricultural Limestone Via Mo.-Ill. (PIT AND QUARRY, July 13, 1932.)

Cement.—Finding the rates on cement from Speed, Ind., to Brixment, N. Y., not unreasonable or unduly prejudicial, the commission by Div. 3 has dismissed the complaint.—I.C.C. Docket No. 24,599, Louisville Cement Co. *v.* C. C., C. & St. L. *et al.*

Finding that the rate of 29 c. sought to be collected on two car-loads of cement from Humboldt, Kan., to Sumner, Okla., was applicable and not unreasonable, an undercharge of $300.60 results, a rate of 16½ c. having been paid.—I.C.C. Docket No. 24,843, Monarch Cement Co. *v.* A. T. & S. F. *et al.* (PIT AND QUARRY, May 4, 1932.)

The commission has found justified the proposed increases in the rates on cement from 6½ c. to 8 c. from Monolith, Cal., and from 5½ c. to 7 c. from Colton and Crestmore, Cal., to Long Beach and Los Angeles Harbor, Cal., when transshipped beyond these ports by water to points on the west coast of the United States.—I. & S. Docket No. 3,753, Cement to Los Angeles Ports for Transshipment.

Crushed Stone, Sand and Gravel.—The commission has modified its decision in Docket No. 21,939, sand, gravel and crushed stone from Indiana and Illinois points to destinations in Illinois as abstracted in PIT AND QUARRY, Feb. 24, 1932, in connection with the investigation of suspended reduced rates on crushed stone from Cape Girardeau and Marquette, Mo., to destinations on the Missouri-Illinois R.R., in Illinois, and on sand and gravel from Missouri to Thebes, Ill. In reporting these cases the commission said: "We find that respondents in I. & S. 3,739 and 3,746 have not justified the proposed schedules but they have justified from Cape Girardeau and Marquette, Mo., joint rates to destinations in Illinois on the Missouri-Illinois of 105 c. as far north as Sparta and 120 c. north of Sparta to and including Hoyleton, and a joint rate on sand and gravel of 85 c. over the St. Louis-San Francisco-Chicago & Eastern Illinois route to Thebes, Ill. We further find that the present joint rates on crushed stone from Cape Girardeau and Marquette to Thebes, over the St. Louis-San Francisco-Chicago & Eastern Illinois route, is, and for the future will be, unduly prejudicial to the extent that it is less than 85 c. To the rates herein approved are to be added the present authorized emergency charge. The findings in the prior report, 181 I.C.C. 373, are modified accordingly."—I.C.C. Docket No. 21,939, Sand, Gravel and Crushed Stone from Indiana and Illinois to Illinois. I. & S. Docket No. 3,739, Crushed Stone from Missouri to Illinois. (PIT AND QUARRY, May 18, 1932.) I. & S. Docket No. 3,746, Sand and Gravel from Missouri to Thebes, Ill. (PIT AND QUARRY, June 1, 1932.)

Ground Limestone.—The commission, in response to fourth-section application No. 14,349, has granted relief from the provisions of the long-and-short-haul clause, without making any reference to the equidistant clause, from Falling Spring, Va., to all points in southern territory north of the line of the Seaboard Air Line from Jacksonville to River Jct., Fla. This will enable the carriers to maintain destination groups. The order fixes the carload minimum weight at 60,000 lb., and provides that rates to the groups be made by use of the mileage scale prescribed in 172 I.C.C. 783, the distance to be figured from Falling Spring to the base point in each group instead of to each point in the group.—F. S. O. No. 10,595.

Lime.—Upon further hearing the commission has modified the original report in 159 I.C.C. 9, to the extent of finding that two carloads of lime from Woodville, O., to Bel Air, Md., were misrouted by the Pennsylvania and have awarded $24 reparation.—I.C.C. Docket No. 20, 246, Washington Building Lime Co. *v.* Pennsylvania *et al.* (PIT AND QUARRY, June 29, 1932.)

Examiners' Reports

Cement and Lime.—Examiner Robert M. Furniss recommends that the commission find the rates on cement and lime in mixed carloads from Linwood, Ia., to Red Wing and Goodhue, Minn., not unreasonable, and dismiss the complaint,—I.C.C. Docket No. 25,188, Dewey Portland Cement Co. *v.* C. G. W. *et al.* (PIT AND QUARRY, May 18, 1932.)

Lime.—Examiner Harold M. Brown proposes that the commission find the rates on hydrated lime from Speedway (Indianapolis), Ind., to destinations in Central Freight Assn. territory, including Columbus and Dayton, O., Jackson, Detroit and Flint, Mich., Louisville, Ky., E. St. Louis, Chicago (Union Stock Yards) and Joliet, Ill., not unreasonable or otherwise unlawful, and dismiss the complaint.—I.C.C. Docket No. 25,114, Lime Products Corp. *v.* B. & O. *et al.* (PIT AND QUARRY, May 4, 1932.)

New Complaints Filed

Complaints before the Interstate Commerce Commission generally allege violation of one or more sections of the Interstate Commerce Act. These sections are numbered and, while each covers matters other than those bearing on the complaints, in a general way they may be considered to cover the following unlawful acts:

Sec. 1. Unreasonable rates.
Sec. 3. Rates unduly prejudicial to shipper complainant, and unduly preferential of competitors.
Sec. 4. A higher rate for a shorter distance than for a shorter distance over the same route, or a through rate higher than the aggregate of intermediate rates.
Sec. 6. Rates not published according to I.C.C. Rules.
Sec. 13. Rates between points within a state prejudicial to interstate commerce.

Cement.—Charging violation of Sec. 1 and 3 with shippers in the Lehigh district preferred, complainants have attacked the rates on cement from Alsen, N. Y., to Harlem River Transfer (D. L. & W.), N. Y., via interstate routes, asking for new rates and reparation.—I.C.C. Docket No. 25,557, North American Cement Corp., New York, N. Y. *v.* N. Y. C. *et al.*

Dolomite.—Alleging violation of Sec. 1 on the shipment of ram dolomite from McVitty's, O., to Freeport, Ill., the complainant seeks reasonable rates and reparation.—I.C.C. Docket No. 25,383, Sub. No. 1, The Herzog Lime & Stone Co., Forest, O. *v.* C. M. St. P. & P. *et al.*

Lime.—Reasonable rates and reparation on the shipment of lime from Linnville and Strasburg Jct., Va., to Charleston and South Charleston, W. Va., are prayed for, the damages alleged amounting to $10,000.00.—I.C.C. Docket No. 25,571, Rockdale Lime Co., Inc., Linnville, Va. *v.* B. & O. *et al.*

Plaster-Board.—New rates and reparation are sought on an allegation of rates on plaster-board from Acme, Tex., to points in New Mexico violating Sec. 1, 3, 4, and 6 of the Interstate Commerce Act; as compared with

rates to more distant points, such as Los Angeles, Cal.—I.C.C. Docket No. 25,553, Certainteed Products Corp., New York, N. Y. *v.* A. T. & S. F. *et al.*

Rock Asphalt.—Complainants allege unreasonable rates on bituminous rock-asphalt from Rockport and Bowling Green, Ky., to Decatur, Ind., also undue preference for shippers of asphaltic limestone, and ask for new rates and reparation.—I.C.C. Docket No. 25,540, O. W. P. Macklin, Decatur, Ind. *v.* I. C. *et al.*

Sand.—Complainants allege violation of Sec. 1 and 3 on the shipment of glass sand from Gore, Va., to destinations in official territory, with shippers at Berkeley Springs, W. Va., Mapleton and Tatesville, Pa., preferred, and ask for new rates.—I.C.C. Docket No. 25,587, Virginia Glass Sand Corp., Winchester, Va. *v.* A. C. & Y. *et al.*

Sand and Gravel.—Alleging violation of Sec. 1, 3 and 13, on sand and gravel from Hanover, Kan., to Princeton, Cortland and Pickrell, Neb., with the shippers at Valley and Fremont, Neb., preferred, new rates are sought. —I.C.C. Docket No. 25,558, Washington County Sand and Gravel Co., Lincoln, Neb. *v.* U. P. et al.

Rate-Committee Dockets

New England Freight Assn.

Talc.—Shippers propose a reduction in the rate on roofing or waste talc, car-load minimum weight 60,000 lb., from Johnson and Chester, Vt., to Sandusky, O., from 29 c. per 100 lb. to $4.70 per net ton.—Docket No. 26,952.

Trunk Line Assn.

Complete exhibits showing the proposed rates under any of the following proposals will be furnished on request.

Crushed Stone.—Carriers propose to establish a rate on crushed stone [1] from Greer, W. Va., to Mather, Pa., of $1 per net ton.—Docket No. 29,949, Sup. 1.

Shippers propose a reduction in the rate on crushed stone [1] from Caspiras, Pa., to Everson, Pa., from 60 c. to 50 c. per net ton, to expire Feb. 10, 1933.—Docket No. 29,987.

Ground Limestone.—Shippers propose a reduction in the rate on ground limestone, carload minimum weight 50,000 lb., from Bellefonte and Pleasant Gap, Pa., to Vineland, N. J.; from 15½ c. to 14½ c. per 100 lb.—Docket No. 29,922.

Carriers propose to establish a rate on ground limestone, car-load minimum weight 50,000 lb., from Grove, Frederick, Keller, Buckeystown, Rosedale and Baltimore, Md., Engle and Martinsburg, W. Va., to Vineland, N. J., of 14½ c. per 100 lb.—Docket No. 29,922, Sup. 1.

A line of rates on ground limestone, car-load minimum weight 50,000 lb., from Howe's Cave, N. Y., to destinations on the B. & M., Boston, Mass., Portland, Me., Claremont, N. H., Windsor, Vt., and various others, ranging from 13 c. to 17 c. per 100 lb., is proposed by shippers.—Docket No. 29,968.

Shippers at Howe's Cave, N. Y., propose a line of rates on ground limestone, car-load minimum weight 50,000 lb., to stations on the Catskill Mountain Branch of the N. Y. C., ranging from $2.30 to $3.40 per net ton, which are claimed to be comparable with the rates from Jordanville, N. Y.—Docket No. 29,974.

Roasted Dolomite.—Shippers at Blue Bell and Williams, Pa., are proposing a line of rates on roasted dolomite [2], to Lansdowne, Pa., Newark Stations, N. J., Donora, Pa., Follansbee, W. Va., Steubenville, O., Cleveland, Mansfield, Marion and Cincinnati, O., Dunkirk, N. Y., and various others, ranging from $1.51 to $3.78 per net ton.—Docket No. 29,991.

Central Freight Assn.

Asbestos.—Shippers propose that the rates on asbestos gravel, refuse or shorts, testing 0-0-5-11 or lower, car-load minimum weight 60,000 lb., to Chester, W. Va., from Sherbrooke, Danville and Warwick, Que., be reduced to 28½ c. per 100 lb.—Docket No. 33,299.

Crushed Stone.—Shippers at Marble Cliff, O., propose establishment of the following reduced rates on crushed stone and related articles: To Kenova, Ceredo, Buffalo Creek, W. Va., $1.50; to Lavalette, Wayne, W. Va., $1.60; to Dunlow, W. Va., $1.70 and to Williamstown, W. Va., $1.80 per net ton.—Docket No. 33,306.

Shippers at Woodville, O., propose the establishment of the following reduced rates on crushed stone and related articles to destinations in Pennsylvania in Docket No. 33,457:

To	Route *	Present	Proposed
Albion	1	$4.00	$2.00
Cambridge Springs	2	4.20	2.00
Concord	2	4.40	2.10
Corry	3	4.40	2.00
Corry	2	4.40	2.10
Franklin	3	4.20	1.80
Franklin	2	4.20	2.10
Franklin	4	4.20	1.90
Greenville	3	3.80	1.90
Greenville	1	3.80	1.90
Grove City	1	4.20	2.00
Harrisville	1	4.20	2.00
Meadville	1	4.20	2.00
Meadville	2	4.20	2.00
Pulaski	2	3.80	1.90
Springboro	1	4.20	2.00
Sugar Creek	2	4.20	2.10

* Route 1, P. R. R., Shenango, B. & L. E.; route 2, P. R. R., transfer, Erie; route 3, P. R. R. direct; route 4, P. R. R., Toledo, N. Y. C.

A reduction in the rate on crushed stone from Narlo, O., to Cleveland, O., from 80 c. to 60 c. per net ton is proposed by shippers.—Docket No. 33,467.

Dolomite.—Carriers propose to amend agency and/or individual lines' tariffs, naming rates on raw or crude dolomite and fluxing stone, carload, between points in C.F.A., territory as follows:

(1) Change commodity description when loaded in open-top car equipment to read: "Stone, raw or crude, furnace or foundry (unburned), in open-top equipment only." [1]

(2) (a) To change commodity description when loaded in box-car equipment to read: "Stone, raw or crude, crushed, ground or pulverized (unburned), in box-car equipment, minimum weight 60,000 lb."

(b) To establish commodity rates on stone, raw or crude, crushed, ground or pulverized (unburned), in box-car equipment, car-load minimum weight 60,000 lb., to all destinations in C.F.A. territory to which rates are now published on dolomite, raw or crude, carload, on the basis of 13 per cent. of first class; or Col. 13 rates to interstate destinations, the Gibsonburg, O., Col. 13 rates to be applied from all origins in Northwestern Ohio Group 1; rates from origins not located in Group 1 to be on the basis of Col. 13 from each respective origin group. To Ohio destinations on Ohio intrastate traffic, the rates to be the same as prescribed by the Public Utilities Commission of Ohio in Docket No. 2,327 on agricultural limestone in box-car equipment, subject to Col. 13 as maximum. A statement of present and proposed rates in cents per ton from (A) Bettsville, Maple Grove and Narlo, O.; (B) Gibsonburg, O.; (C) Carey, O.; (D) Genoa and Martin, O.; (E) Durbin, O.; and (F) McVitty's, O.; is shown in the table on the next page.—Docket No. 33,374.

Shippers at Luckey, O., are asking for the establishment of rates on raw or crude dolomite and fluxing stone to destinations in Ohio, Pennsylvania, Illinois, Indiana, Michigan, Iowa, New York, West Virginia, Wisconsin and Missouri, the same as are now in effect from Genoa and Martin, O.—Docket No. 33,459.

Sand and Gravel.—Shippers at Lodi, O., are asking for a reduction in the present 90 c. rate on sand and gravel to Valley City, O., to 70 c. and to Cleveland, O., to 74 c. per net ton, to expire Dec. 31, 1932, the rate after the expiration date to become 80 c.

Illinois Freight Assn.

Stone.—It is proposed to reduce the rate on stone as described in Sec. 1 of I.C.R.R. Tariff 13,321-G, I.C.C. A-10,242, from Thornton, Ill., to Rockford, Ill., from $1.20 to $1.05 a net ton.

Western Trunk Line Committee

The following rate changes are proposed on cement car-load minimum weight as shown in Item 10-A, Sup. 15 of W.T.L. Tariff No. 132-H, from (A) Alpha, Mo., and (B) Prospect Hill and St. Louis, Mo.—Docket No. 8,133, Sup. 1.

To	From (A) Present	From (A) Proposed	From (B) Present	From (B) Proposed
Webster Grove, Mo.	7	4	7	4
Kirkwood, Mo.	7	4	7	4
Windsor Springs, Mo.	8	5	8	5
Osage Hills, Mo.	8	5	8	5
Valley Park, Mo.	8	5	8	5
Hydraulic, Mo.	2†	§	7	4
Gravois, Mo.	2†	§	7	4
Alpha, Mo.	..	..	7	4

† Minimum $15 per car.
§ No change.

Southern Freight Assn.

Lime.—Shippers propose the amendment of Sec. 8 of Agent Speiden's Tariff 382-A to allow rates to apply for joint as well as single-line hauls. —Docket No. 59,573.

Mica.—Shippers propose the establishment of a commodity rate on crude or scrap mica from Lenoir, N. C., to Chicago, Ill., of 34 c. per 100 lb.—Docket No. 59,441.

Soapstone.—At the request of shippers for commodity rate adjustments on soapstone, the carriers propose to establish a rate of 21½ c. per 100 lb. on soapstone or talc, crude or ground, straight or mixed car-loads, car-load minimum weight 50,000 lb., from Newport News, Norfolk, Pinner's Point and Portsmouth, Va., to apply on import and intercostal traffic, to the following destinations: Asheville (Biltmore), Durham, Yadkin, Kannapolis, Concord, N. C., Lyman, Greenville, Rock Hill, Clevedale, Ware Shoals and Travelers Rest, S. C. Wharfage and handling charge to be in addition.—Docket No. 59,400.

Carriers propose to cancel all specific commodity rates on soapstone or talc from Savannah, Ga., and Charleston, S. C., to points in South Carolina applicable on import traffic or traffic from the Pacific coast through the Panama Canal and apply in lieu thereof Class P rates authorized in Item 443, Note 53 (South Carolina Exception Sheet), of Exceptions No. 9 to Southern Classification, Agent Dulaney's I.C.C. No. 40.—Docket No. 59,549.

Southwestern Freight Bureau

Cement.—To meet motor-truck competition shippers propose the establishment of the following scale of rates on cement, car-load minimum weight 50,000 lb., from Memphis, Tenn., to points in Arkansas.—Docket No. 25,736.

Distance	Rate
25 mi. and under	3
30 mi. and over 25 mi.	4
35 mi. and over 30 mi.	5
40 mi. and over 35 mi.	6
45 mi. and over 40 mi.	7
50 mi. and over 45 mi.	8

On the complaint from shippers that the present stop-over privileges partly to unload cement is demoralizing the trade, the carriers propose to cancel all such privileges in S.W.F.B. territory, both from points in S.W. F.B. and other territories.—Docket No. 25,742.

Western Trunk Line Committee Docket No. 8,133, Sup. 1, is being considered by the Southwestern Freight Bureau as Docket No. 25,766.

Shippers propose the establishment of specific rates on cement, car-load minimum weight 50,000 lb., from Okay Jct., Ark., to points on the P. I. & R. G. V. Ry., on the basis of the mileage scale used in checking in rates from Kansas Gas Belt points to the same destinations, as shown on p. 55 of S.W.L. Tariff 150-D.—Docket No. 25,796.

To:	Present from: (A)	(B)	(C)	(D)	(E)	(F)	Proposed
Alton, Ill.	277	...	277	...	277	277	280
Anderson, Ind.	170	170	170	170	202	170	170
Butler, Pa.	...	...	166	166	176	166	200
Charleston, W. Va.	...	227	227	227	...	227	220
Chicago, Ill.	240	240	240	239	240	240	220
Clarksburg, W. Va.	265	...	265	...	...	265	220
Detroit, Mich.	...	105	105	101	202	105	140
Dunkirk, Ind.	165	...	165	...	...	165	170
E. St. Louis, Ill.	315	315	315	277	315	315	280
Fairmount, W. Va.	206	196	...	265	...	...	220
Huntington, W. Va.	...	202	202	202	...	202	200
Jeanette, Pa.	...	...	166	...	176	166	200
Kokomo, Ind.	180	...	180	...	...	180	180
Lancaster, O.	...	...	...	...	...	...	180
Marion, Ind.	170	170	170	170	202	170	170
Midland, Mich.	...	...	...	...	...	...	180
Middletown, O.	...	144	144	144	...	144	150
Muncie, Ind.	170	170	170	170	202	170	170
Newark, O.	...	...	...	...	...	...	160
Pittsburgh, Pa.	...	166	166	166	176	166	200
Sistersville, W. Va.	202	...	...	...	...	...	220
Streator, Ill.	265	265	265	265	...	265	240
Terre Haute, Ind.	...	...	239	...	239	239	220
Washington, Pa.	...	...	166	...	176	166	200
Youngstown, O.	...	105	105	105	128	105	150
Zanesville, O.	...	...	113	...	113	113	160

Crushed Stone.—Shippers propose the establishment of a rate of $2.50 to Holly, Colo., and $2.80 per net ton to Rocky Ford Swink and Sugar City, Colo.; on limestone, crushed (broken into pieces ranging up to 200 lb. weight) or ground,[1] from Carthage, Mo., to allow shippers at that point to compete for the business of the sugar refiners in the destination cities.—Docket No. 25,748.

Gypsum Rock.—A commodity rate of 24 c. per 100 lb., on crude gypsum rock, ground but not further processed, car-load minimum weight 50,000 lb., from Ft. Dodge, Iowa and group, to Drumright, Okla., is proposed by shippers.

Lime.—Shippers at Mosher and Ste. Genevieve, Mo., propose the establishment of a rate of 22½ c. on lime, car-load minimum weight 40,000 lb., to alternate with the present rate of 23½ c. per 100 lb., car-load minimum weight 30,000 lb., to Topeka, Kan.—Docket No. 25,754.

Plaster.—Shippers are asking for the privilege of three stops partly to unload car-load shipments of plaster, at a charge of $6.30 per car per stop, in S.W.F.B. territory, subject to the rules and regulations shown in Item 5 of Sup. 27 of S.W.L. Tariff No. 3-I. —Docket No. 25,724.

Shippers at Medicine Lodge, Kan., propose the establishment of a rate of 23½ c. per 100 lb., on wall plaster and related articles, car-load minimum weight 60,000 lb., to Galveston and Houston, Tex., for export, shipside delivery. They complain that they are not able to compete with shippers at Southard, Tex., with an export rate of 22 c., in the sale of their products in Cuba.—Docket No. 25,814.

Rock Asphalt and Crushed Stone.—Shippers propose the establishment of a rate of $5 per ton on rock asphalt, natural or coated with not to exceed 5 per cent. of road oil, crushed or ground stone, coated with not to exceed 5 per cent. of road oil,[2] from Blewett, Cline, Dabney, La Pryor, Pulliam and Whitesmine, Tex., to Lincoln and Omaha, Neb.—Docket No. 25,750.

Sulphur.—Shippers propose the establishment of a rate of 55 c. on crude sulphur and 64 c. per 100 lb. on refined sulphur, as described in S.W.L. Tariff 102-O, to Belle Fourche, S. D., from all Texas producing points except Byram, which will be 3 c. per 100 lb. higher than from the other producing points.—Docket No. 25,740.

Classification Rule 23.—Carriers propose to publish an exception to Rule 23 of the Consolidated Classification from, to and between points in the Southwest, under which the agents of the carriers would be authorized to act as the agent of the shipper in the distributing and reforwarding of freight in packages or containers. The above rule will be published as an exception to the classification in S.W.L. Tariff No. 173-D and other bureau issues not governed thereby, and to apply for an experimental period of six months from the date it becomes effective. The particular wording of the rule and the charge for the service will be determined after a public hearing has been held. The proposed exception is made with a view to retaining on the rail lines high-class traffic which is being solicited by motor-truck lines.—Docket No. A-876.

Transcontinental Freight Bureau

Cement.—Carriers propose the establishment of a rate of 68½ c. on cement, car-load minimum weight 60,000 lb., from Leeds, Ala., in Tariffs 1-L and 4-I.—Docket No. 14,264.

Ground Stone.—Shippers request a rate of 40 c. on ground stone, car-load minimum weight 100,000 lb., westbound, from Group D and west in

(Continued on Page 60)

Recent Patents

AMERICAN

Concrete

Cement powder and mortar powder. Karl Frank and Karl Dietz, Frankfort-on-the-Main, Germany, assignor to I. G. Farbenindustrie. No. 1,883,675.

Crushing and Grinding

Crusher-roll construction. George E. Smith, Philadelphia, Pa., assignor to American Engineering Co., same place. No. 1,884,316.

Crushing machinery. William A. Battey, Haverford, Pa., assignor to Pennsylvania Crusher Co., New York, N. Y. No. 1,884,523.

Crushing machinery. George W. Borton, New Lisbon, N. J., assignor to Pennsylvania Crusher Co. No. 1,884,544.

Method and apparatus for pulverizing and treating material. Walter J. Wohlenberg, New Haven, Conn., assignor to Erie City Iron Works, Erie, Pa. No. 1,883,218.

Pulverizing apparatus. William A. Woodeson, Gateshead-on-Tyne, England. No. 1,881,013.

Drilling

Rock-drill. Elmer E. Gartin, Claremont, N. H., assignor to Sullivan Machinery Co., same place. No. 1,884,651.

Rock-drill. Elmer E. Gartin, assignor to Sullivan Machinery Co. No. 1,884,652.

Rock-drill. Ivan S. Carpenter, Denver, Colo., assignor to Gardner-Denver Co., same place. No. 1,884,969.

Rock-drill. William F. Dalzen, Grosse Pointe Park, Mich. No. 1,885,085.

Excavating

Traction drive mechanism for worm-drive shovels. Harold E. Brey, Milwaukee, Wis., assignor to Koehring Co., same place. No. 1,883,874.

Excavating system. Gwynn L. Lillard, Memphis, Tenn., assignor to Harnischfeger Corp., Milwaukee, Wis. No. 1,881,743.

Cutting and loading machine. Frank A. Lindgren, Western Springs, Ill., assignor to Goodman Mfg. Co., Chicago, Ill. No. 1,881,744.

Excavating machinery. Rolf Ljungkull, Wauwatosa, Wis., assignor to Harnischfeger Corp. No. 1,881,748.

Drag-line excavating-bucket. Omar R. and Walter G. Humphreys, Omaha, Neb. No. 1,882,147.

Skimmer scoop. Ernest P. Standfuss, Milwaukee, Wis., assignor to Harnischfeger Corp. No. 1,883,052.

Shoveling-machine. William Whaley, Knoxville, Tenn. No. 1,883,200.

Excavator. Ary C. Clark and Arthur L. Graves, Imperial, Cal.; said Graves assignor to Imperial Irrigation District. No. 1,880,807.

Hauling

Hub closure for mine-car wheels. Benjamin F. Faunce, Johnstown, Pa., assignor to Brown-Fayro Co., same place. No. 1,881,071.

Loading

Power-driven loader. Frederic W. James, Belleville, N. J., assignor to N. P. Nelson Iron Works, Passaic, N. J. No. 1,882,629.

Material Handling

Dipper stick foot piece. Alpheus E. Holcomb, Milwaukee, Wis., assignor to Koehring Co., same place. No. 1,883,915.

Trolley bucket. George L. Morehead and Charles M. Young, Jr., Philadelphia, Pa., assignors to Link-Belt Co., Chicago, Ill. No. 1,884,109.

Apparatus for handling sand and similar material. Walter E. Naylor, Chicago, Ill., assignor to Beardsley & Piper Co., same place. No. 1,882,440.

Clam bucket. John W. Emerick, Detroit, and William E. Emerick, Mount Clemens, Mich. No. 1,882,489.

Mining

Mining apparatus. Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery Co. No. 1,884,692.

Mining apparatus. Morris P. Holmes, assignor to Sullivan Machinery Co. No. 1,884,693.

Mining machine. Morris P. Holmes, assignor to Sullivan Machinery Co. No. 1,884,695.

Mining machine. Morris P. Holmes, assignor to Sullivan Machinery Co. No. 1,884,696.

Mining machine. Louis M. Weld, John H. Ohler and Clarence E. Berkley, Meyersdale, Pa. No. 1,884,986.

Mining machine. Thomas E. Pray, Chicago, Ill., assignor to Goodman Mfg. Co. No. 1,881,936.

Mining tool. Percy W. Hurley, Sharon Hill, Pa. No. 1,880,252.

Miscellaneous

Apparatus for producing aggregates. Richard Hedrick, Los Angeles, Cal. No. 1,882,421.

Screening

Apparatus for screening materials. Don A. Weber, Fort Wayne, Ind., assignor to Deister Concentrator Co., same place. No. 1,883,186.

PIT AND QUARRY will furnish, at its actual cost, a copy of any patent cited here. A charge of ten cents per copy is made by the U. S. Patent Office, Washington, D. C., and readers may procure a copy directly by addressing the Commissioner of Patents, with payment for copies requested. Postage stamps are not accepted by the Patent Office. We will endeavor to obtain copies of foreign patents for our readers but we cannot give assurance in every case for the reason that copies of such patents are not printed for distribution as liberally as are the American copies, nor is there a fixed charge per copy.

FOREIGN

Blasting and Explosives

Explosives. Canadian Industries, Ltd., Montreal, Que. Canadian 326,147 and 326,148.

Explosive priming composition. Canadian Industries, Ltd. Canadian 326,149.

Percussion-cap priming composition. Canadian Industries, Ltd. Canadian 326,150.

Crushing and Grinding

Device for protecting the drive mechanism of tube-mills. Hans Joachim Müller, Berlin. German 547,188.

Reinforcement for jaw crushers. Soc. Anon. des Etablissements G. Pinette, Chalon-sur-Seine, France. German 546,468.

Centrifugal grinding mill. Eksploatacja Wynalazkow Sp. 2 Ogr. Odp., Warsaw, Poland. German 546,309, addition to 549,975.

Stone-crusher. George E. Krider, Duncansville, Pa. Canadian 326,296.

Drilling

Pneumatic tools. W. W. Triggs (Ingersoll-Rand Co.). British 379,191.

Rock-drills and like tools. J. L. Holman, P. M. Holman and Holman Bros., Ltd. British 379,374.

Material-Handling

Weighing apparatus, especially for construction materials. Koehring Co., Milwaukee, Wis. German 552,813.

Loading or conveying systems for use in mines or elsewhere. S. Walton-Brown. British 379,365 and 379,377.

Apparatus for feeding or conveying cement in cement works or for feeding or conveying pulverulent material for other purposes. I. Sablik. British 379,510.

Jigger conveyors. A. Eickhoff (Eickhoff Maschinenfabrik und Eisengiesserei). British 379,623.

Conveyors. Gesellschaft Eisenhütte Westfalia. British 379,624.

Troughing idlers for conveyor belts. A. H. Stevens (Robins Conveying Belt Co.) British 379,875.

Mining and Quarrying

Mine props. H. Morgan, E. L. Morgan and M. G. Morgan. British 379,750.

Roof-supports for mines. A. Naylor, H. J. Atkinson and L. W. Waters. British 379,839.

Supporting-bar for supporting the roof at the working faces in mines. M. Schneider. British 379,975.

Sacking

Closing-device for bag-filling machine. St. Regis Paper Co., New York, N. Y., assignee of William R. Peterson. Canadian 326,222.

Bag-filling machine. St. Regis Paper Co. Canadian 326,223.

Bag-filling spout. Arno Andreas, Munster, Westfalia, Germany. Canadian 326,263.

Foreign Developments

Separation Avoided in Air-Swept Tube Mill

One advantage of the air-swept tube-mill that has not been pointed out in recent discussions of this grinding method is that it grinds mixtures of materials of different adaptability to grinding and still produces a chemically homogeneous product. This is particularly important in grinding raw cement mixes of materials from several quarries, as at the Azuga plant in Rumania, of which the writer is chief chemist. There the materials are a calcareous marl, very hard and with a conchoidal fracture but which tends to ball in grinding; a hard but easily ground limestone; and an extremely hard Rumanian bauxite very hard to grind.

Formerly when this mix was ground in a two-compartment compound mill it was found that an actual selection of the materials took place during the grinding, the residue on the screen being richer in lime than the raw mix, and this enrichment in lime increased with increasing fineness of grinding. With the air-swept tube-mill, however, the product remains homogeneous, regardless of the varying grinding qualities. This is obviously a great advantage in the manufacture of cement of uniform quality.—N. Nicolaescu in *Revue des Materiaux de Construction* No. 272, pp. 192-194, May, 1932.

Effect of $CaSO_4$ Added To Ground Clinker Meal

In an investigation to study the action of different compounds of $CaSO_4$ on ground clinker with variation in the time of stirring, it was found that, with the addition of 2.5 per cent. and more of hem-hydrate or soluble anhydride to the ground clinker, a "false" rapid set takes place, occasioned by its capacity of forming strongly supersaturated solutions. This false rapid set can be avoided by admixture of gypsum.

Further investigations were made on the effect of $CaCl_2$, $MgCl_2$, K_2SO_4 and Na_2SO_4 on ground clinker plus gypsum. The varying action of the last two salts is explained by double-salt formation. Na_2CO_3 and K_2CO_3 act on ground clinker plus gypsum to destroy the gypsum. With greater admixtures of gypsum more alkali carbonate can be added before rapid setting sets in. Na_2CO_3 has a greater accelerating effect than K_2CO_3.

Phenomena of overstirring ground clinker plus gypsum and $KNaCO_3$ at different water ratios were also studied. The setting time is retarded with increasing stirring time. The quantity of water plays a minor role.

The effect of alkali carbonate on ground clinker plus 2 per cent. of hemihydrate is the same as in the case of the admixture of 3 per cent. of gypsum. With 4 per cent. admixture of hemihydrate, K_2CO_3 has a greater accelerating action than Na_2CO_3, which is explained by the formation of double salt. Na_2CO_3 can even retard the false rapid set so greatly that the cement becomes slow-setting.

With the use of 3 per cent. of soluble anhydride as a retarder of set, alkali carbonate has a much greater accelerating action than with admixture of hemihydrate. This is based on the fact that the soluble anhydride must first be converted into hemihydrate to become soluble. During this conversion process of around 2 min. molecules of $CaSO_4$ are not sent into solution in any marked extent.—Dr. phil. Paul Schachtschadel in *Zement* 21:509-512 and 523-526, Sept. 8 and Sept. 15, 1932.

Unhydrated Particles Effect Reset Strength

Last year (*Tonindustrie-Zeitung* 1931, No. 100) the author reported on an investigation of the relations between hydration and strength of cement. In the application of the results of that investigation, it was necessary to assume that the strength of cement on second set depended on the particles not previously hydrated. The present investigation therefore was made to study the "specific strength" of the hydrated portion. Two parallel series in varying mixing proportions were made, one being made with standard sand and one with equivalent additions of finely ground setting-test specimens one to two years old. Specimens in each series were dried at 1, 3, 7 and 28 days, ground and made again into mortar test specimens.

Examination of the strength-test results on the specimens so obtained indicate that the hardening of reground set cement is, first and foremost, to be attributed to the presence of clinker particles that have not previously reacted. The hydraulic properties of the hydration products of the clinker enter only as a much weaker factor. The quantities of unhydrated clinker estimated on the basis of the strengths correspond to those calculated on the basis of gradation analyses and reaction curves. The dependence of compressive strength on the quantity of hydrated cement can (practically speaking) be represented as a straight line.—A. Eiger in *Zement* 21:500-502, Sept. 1, 1932.

Study Exothermic Effect In Forming Slag Cement

The requirements of energy in the formation of Portland-cement clinker from blast-furnace slag and limestone comprise two quantities: (1) the heat exchange during the sintering of the clinker, and (2) the work of decarbonating the raw mix. At the sintering temperature heat is released in the formation of the silicates, which are the principal components of Portland cement. D. Tschernobajeff in 1905 determined the formative heat of tricalcium-silicate as 125 cal. per gram, and it is to be expected that the exothermic effect in the formation of cement is in the same order of magnitude. W. Richards calculated the release of energy as 354 cal. per gram of clinker, but Le Chatelier, after rejection of some untenable assumptions, reduced this figure to 159 cal.

In the present investigation the exothermic effect, in the case of clinker formed from slag and limestone, was determined separately by three different procedures, though all depended on the determination of heat of solution and subsequent calculation: (1) the process of Dittler, Jesser and Nacken, (2) that of the separate determination of the heat of solution of slag and of CaO, and (3) that of a circular process with the help of Hess' proposition. The values thus independently obtained were 168, 169 and 170 cal. per gram of clinker—a remarkably close agreement. Similar studies on the exothermic effect in the sintering of clinker from clay and limestone are under way.—H. E. Schwiete and H. Elsner von Gronow in *Zement* 21:497-500, Sept. 1, 1932.

Anniversary Concerns History of Rotary Kiln

This year the Portland Cementfabrik Hemmoor, Hemmoor, Germany, is celebrating its fiftieth anniversary as a company. Its history really goes even farther back, for in 1862 a lime plant was established at the site and in 1866 it was rebuilt into a small Portland-cement factory. As the oldest German cement plant was established only in 1855, Hemmoor's history is really almost parallel with that of the industry. It was the second European plant to install a rotary kiln. The first was at Lollar near Giessen, installed by Karl von Forell, who made this first installation unaware of similar developments in America. Unfortunately, that first kiln at Lollar was soon out of operation because of the shut-down of the plant, but in the meantime the man-

The Hemmoor cement plant as it appears to-day.

ager at Hemmoor had seen it and had von Forell install one there. The Hemmoor plant is consequently associated with some of the "growing pains" of the rotary-kiln idea, and troubles there indeed were. One of the early difficulties was the impossibility of making the fuel conduits tight, and coal dust escaped in such quantities that those working on the new kiln were referred to as the "Hem-Moors" and the section of the plant around the kiln as the "Negro quarter."

This plant was also an early user of pneumatic conveying of slurry. The first slurry pumps were installed in 1899; at that time the pumps simply elevated to open troughs.

The raw materials of the plant are chalk and clay. The original periodic shaft kilns were replaced in 1887 by Dietz stake kilns. At the same time the first tube-mill was installed. At the turn of the century the first rotary kiln, along with a ball-and-tube mill, was put into service. In 1909 the whole plant was changed to rotary-kiln operation and the grinding equipment improved so that the standard specifications of the time were greatly exceeded.

At present the raw materials are made into slip in five chalk basins and two clay basins. The materials are then ground in 7 tube-mills and pumped to the correction and storage-silos. The mix is burned in 8 rotary kilns. Clinker storage, with a traveling crane, holds 80,000 bbl. Clinker is ground in 4 compound mills to a residue of 8 to 10 per cent. on the 4,900-mesh sq.cm. sieve. Throughout the process careful check on the various stages is maintained by laboratory samples. The plant has its own electric generating station with a peak capacity of 6,000 kv.-a., serving near communities as well as the plant.

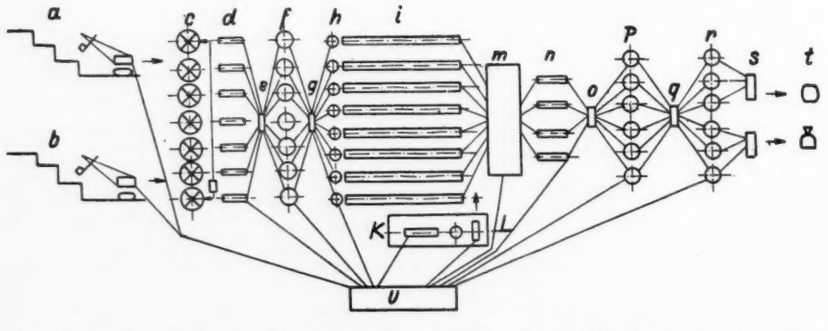
In its fifty years Hemmoor has shipped around 28,000,000 bbl. of cement to north Germany, European coasts, South America, India, China, Japan and the former German colonies. In 1902 the company built a plant at LaSalle, Ill., under the name German American Portland Cement Works to counterbalance the vanished American market for its German cement. At the outbreak of the war, this plant passed into American control.—*Tonindustrie-Zeitung* 56: 926-927, Sept. 12, 1932, and *Zement* 21: 494-496, Aug. 25, 1932.

Most Iron in Bauxite Is Limonite and Hematite

The extent of iron-bearing bauxite deposits and the objections to such iron content in the cement industry and other industries using bauxite leaves no question of the importance of trying to remove at least the greater part of what iron compounds are present. In this investigation the author set out to determine in what forms the iron occurs in natural bauxite. The study was based in part on the results of dehydrating (heating) and, in part, on subjecting various specimens of bauxite to solution in concentrated hydrochloric acid. From the data so obtained it can be concluded that the greatest part of the iron occurs in the form of hydroxide of limonite type and oxide of hematite type; both types can be clearly shown as present. Bauxite also contains insoluble or slightly soluble iron compounds, probably the hydrosilicate or aluminate; the Hungarian bauxites do not contain carbonate. The circumstance that the iron is partially combined with silica explains why it has not so far been possible to remove the iron or to separate completely the iron and aluminum in bauxites or iron-aluminum ores. — Dipl. — Ing. Josef Györki in *Tonindustrie-Zeitung* 56:-913-914, Sept. 8, 1932.

Importance of Welding To the Cement Industry

Welding processes deserve special attention from the cement industry because they offer possibilities of lowering equipment costs. Welding has, of course, been known and used in repair work for a considerable time but, with the development of electric welding, more and larger parts and machines (and even frames of buildings) are being made by welding processes. Excavators and excavator parts, elevator buckets, screw-conveyors, spouts, bins, rotary trommels, dryers and kilns, conduit pipes and the like are some of the specific applications to the cement industry. Some parts, such as conveyor idlers and gears, are being welded instead of being cast solid as heretofore. The development of welding is particularly important as applied to hammer crushers, because hammers attached by welding to the roll are excellently resistant to wear. —Dipl.-Ing. Ernst Falk in *Tonindustrie-Zeitung* 56:901-902 and 924-925, Sept. 5 and Sept. 12, 1932.



Schematic drawing of the manufacturing processes at Hemmoor; *a*, chalk pit; *b*, clay pit; *c*, five chalk and two clay basins; *d*, wet raw mills; *e*, pneumatic slip conduits; *f*, correction and storage silos; *g*, mixing and conveying unit for raw mix; *h*, slurry feed; *i*, rotary kilns; *k*, coal preparation; *l*, pneumatic coal conveying; *m*, clinker storage; *n*, finish mills; *o*, pneumatic cement conveying; *p*, cement storage and mixing silos; *q*, cement mixing and conveying unit; *r*, packing bins; *s*, packing house; *t*, loading; *u*, laboratory.

Financial News

The information contained in these financial pages is given with the understanding that any statement on the part of this magazine or any of its staff, as to the responsibility or standing of any person, firm or corporation, or as to the value of any property or securities is a mere expression of opinion, given as a matter of service to the readers of PIT AND QUARRY, *for which no responsibility in any way is to attach to this magazine or to any of its staff.*

Quarterly Net Income Rises for Texas Gulf

The Texas Gulf Sulphur Co., Inc., reports for the quarter ended Sept. 30, 1932, net income of $1,434,853 after depreciation and federal taxes, but before depletion, equivalent to 56 c. a share on 2,540,000 shares of no-par stock. This compares with $1,384,423, or 54 c. a share in preceding quarter and $2,315,926, or 91 c. a share in September quarter of 1931.

For the nine months ended Sept. 30, 1932, net income was $4,541,811 before depletion, equal to $1.78 a share, comparing with $6,704,091, or $2.64 a share in first nine months of the previous year.

During the last quarter the company decreased its reserves for depreciation and accrued federal taxes by $77,072, making total of these reserves $13,570,379 on Sept. 30, 1932.

The statement for the quarter ended Sept. 30, 1932, compares as follows:

	1932	1931	1930	1929
*Net income	$1,434,853	$2,315,926	$3,341,753	$4,028,959
Dividends	1,270,000	1,905,000	2,540,000	2,540,000
Surplus	$ 164,853	$ 410,926	$ 801,753	$1,488,959

Nine months ended September 30:

	1932	1931	1930	1929
*Net income	$ 4,541,811	$ 6,704,091	$10,793,799	$11,480,489
Dividends	3,810,000	6,350,000	7,620,000	7,620,000
Surplus	$ 731,811	$ 354,091	$ 3,173,799	$ 3,860,489
†Profit and loss surplus	26,620,060	25,554,736	24,562,360	19,161,572

* After depreciation and federal taxes. † Includes reserves for depletion.

Alpha Operating Loss Exceeds 1931 Profit

The report of the Alpha Portland Cement Co. for the 12 months ended Sept. 30, 1932, shows consolidated net loss of $1,432,285 after taxes, depreciation, minority interest, etc., comparing with net loss of $382,975 for the 12 months ended Sept. 30, 1931.

The balance-sheet as of Sept. 30, 1932, shows total assets of $27,533,748, comparing with $30,201,910 on Sept. 30, 1931, and surplus (including $5,648,500 arising from reduction of stated value of common stock in 1931), of $5,948,459 against $2,694,547. Current assets, including $5,469,012 cash and marketable securities amounted to $7,901,548 and current liabilities were $306,860 on Sept. 30, last, comparing with cash and marketable securities of $6,609,331, current assets of $9,591,204 and current liabilities of $597,613 on Sept. 30, 1931. Capital stock on Sept. 30, last, consisted of 20,000 shares of 7-per cent. preferred and 711,000 no-par shares of common.

The consolidated income account for the 12 months ended Sept. 30, 1932, compares as follows:

	1932	1931	1930	1929
Net sales	$4,210,575	$6,610,293	$10,294,030	$12,373,664
Operating expenses	4,543,294	5,732,968	7,706,667	9,132,009
Depreciation	1,398,048	1,393,521	1,383,594	1,266,721
Operating loss	$1,730,767	$ 516,196	*$1,203,769	*$1,974,934
Other income (net)	284,542	160,976	228,372	288,815
Loss	$1,446,225	$ 355,220	†$1,432,141	†$2,263,749
Federal taxes	.....	27,755	152,124	274,404
Minority interest	‡13,940	.....	.....	.....
Net loss	$1,432,285	$ 382,975	*$1,280,017	*$1,989,345
Preferred dividends	140,000	140,000	140,000	140,000
Common dividends	355,500	888,750	1,777,500	2,133,000
Deficit	$1,927,785	$1,411,725	$ 637,483	$ 283,655

* Profit. † Income. ‡ Credit.

Johns-Manville Cuts 1931 Losses in Halves

The Johns-Manville Corp. and its subsidiaries report for the quarter ended Sept. 30, 1932, a net loss of $277,693 after depreciation, depletion and taxes. This compares with a net loss of $602,270 in the preceding quarter and a net profit of $261,406, equal, after dividend requirements on 7-per cent. preferred stock, to 17 c. a share on 750,000 no-par shares of common stock in September quarter of 1931.

For the nine months ended Sept. 30, 1932, the net loss was $1,792,571 after charges and taxes, comparing with a net profit of $1,207,174 equal to $1.08 a share on common stock in the first nine months of previous year.

Certain-teed Net Loss Still Moves Upward

The Certain-teed Products Corp. and its subsidiaries report for the quarter ended Sept. 30, 1932, net loss of $367,517 after depreciation, depletion, interest, taxes, etc. This compares with net loss of $328,776 in preceding quarter and net profit of $4,222, equal to 6 c. a share on 63,000 shares of 7-per cent. preferred stock in September quarter of the previous year.

For the nine months ended Sept. 30, 1932, the net loss was $1,208,230 after charges and taxes, comparing with net loss of $196,402 in first nine months of 1931.

The consolidated income account for the quarter ended Sept. 30, 1932, compares as follows:

	1932	1931	1930	1929
Gross profit after depreciation and depletion	$357,552	$838,952	$ 805,542	$1,220,949
Other income	19,847	58,064	59,592	32,472
Total income	$377,399	$897,016	$ 865,134	$1,253,421
Expenses, etc.	579,941	719,975	1,093,226	1,102,254
Bond interest	135,340	160,068	177,632	185,821
Federal tax	.....	†638	1,854	7,600
Sundry adjustments (net)	29,635	13,389	11,650	8,045
Net loss	$367,517	*$4,222	$ 419,228	$ 50,299

Nine months ended September 30:

	1932	1931	1930	1929
Gross profit after depreciation and depletion	$ 970,378	$2,556,892	$2,668,713	$3,164,150
Other income	71,588	111,260	111,515	48,518
Total income	$1,041,966	$2,668,152	$2,780,228	$3,212,668
Expenses, etc.	1,850,432	2,328,673	3,394,858	3,334,798
Bond interest	411,092	501,376	532,897	560,379
Federal tax	.....	7,937	13,560	29,800
Sundry adjustments (net)	†11,328	26,568	15,080	3,468
Net loss	$1,208,230	$ 196,402	$1,176,167	$ 715,777

* Profit. † Credit.

Operating Profit Less for Pennsylvania-Dixie

The report of the Pennsylvania-Dixie Cement Corp. and subsidiaries for 12 months ended Sept. 30, 1932, shows a profit of $329,453 before depreciation, depletion and interest, comparing with profit of $895,392 for the 12 months ended Sept. 30, 1931. After provision for depreciation, depletion and interest there was a net loss of $1,649,864 against net loss of $1,149,688 in the corresponding 12 months of previous fiscal year.

Current assets as of Sept. 30, 1932, including $2,613,183 cash and short-term securities, amounted to $5,110,-344 and current liabilities were $246,-827. This compares with cash and short-term securities of $3,155,842, current assets of $6,227,755 and current liabilities of $357,358 on Sept. 30, 1931.

The consolidated income account for the 12 months ended Sept. 30, 1932, compares as follows:

	1932	1931	1930	1929
Operating profit	$ 329,453	$ 895,392	$2,552,762	$2,930,414
Depreciation and depletion	1,380,844	1,388,425	1,386,517	1,397,257
Loss	$1,051,391	$ 493,033	*$1,166,245	*$1,533,157
Interest	598,473	637,209	681,369	710,980
Federal taxes	.....	19,446	67,684	136,105
Net loss	$1,649,864	$1,149,688	†$417,192	†$686,072

* Profit. † Net profit.

The consolidated balance sheet of the Pennsylvania-Dixie Cement Corp. and its subsidiaries as of Sept. 30, 1932, compares as follows:

ASSETS

	1932	1931
*Land, buildings, machinery and equities	$22,290,600	$23,345,854
Cash	2,443,183	2,785,842
Short-term securities	170,000	370,000
Notes and accounts receivable	656,907	734,024
Inventories	1,840,254	2,337,889
Miscellaneous investments	64,933	340,721
Cash with trustees	510	510
Insurance fund	.....	195,261
Deferred charges	15,413	23,087
Total	$27,481,800	$30,133,188

LIABILITIES

Preferred stock	$13,098,800	$13,588,800
†Common stock	4,000,000	4,000,000
Gold bonds	9,676,000	10,281,000
Accounts payable	138,916	160,442
Accrued taxes, interest, etc.	107,911	148,018
Federal tax reserves	.....	48,898
Other reserves	196,590	376,936
Surplus	263,583	1,529,094
Total	$27,481,800	$30,133,188

* After depreciation and depletion. † Represented by 400,000 no-par shares.

Indiana Limestone Plan Declared in Operation

The reorganization committee for the Indiana Limestone Co. has declared operative the reorganization plan promulgated last March.

The committee's announcement stated that there had been deposited under the plan more than 89 per cent. of the outstanding bonds and more than 83 per cent. of the outstanding debentures, and that additional deposits were being received.

Failing to receive sufficient subscriptions from security holders to a proposed new bond issue to carry out the plan, the company has arranged for an extension of its secured bank loans of $645,000 for one year, thus avoiding the necessity of raising new money to liquidate its loans.

In order to provide for cash requirements, the committee has secured the underwriting of new prior-lien bonds, and accompanying shares of new common stock, at par and accrued interest up to an aggregate of $500,000, which the committee believes should enable it to consummate the plan.

The committee states the company's recent operating results show a material improvement. Based upon the amount of business now in hand, the management forecasts an operating profit, after taxes and interest on bank loans, but before depreciation and depletion, for the fiscal year ending Nov. 30.

Deposits of bonds and debentures will continue to be received up to Nov. 19.

Arundel Net Is $2.33 Against $3.50 in 1931

The Arundel Corp. of Baltimore reports for nine months ended Sept. 30, 1932, net income of $1,147,783 after depreciation, federal taxes, etc., equivalent to $2.33 a share on 492,556 no-par shares of capital stock. This compares with $1,734,387 or $3.50 a share on 495,556 shares in first nine months of previous year. September net income was $48,036 after charges and taxes, against $210,356 in September, 1931.

Current assets as of Sept. 30, 1932, amounted to $4,075,135 and current liabilities were $482,206 comparing with $4,444,292 and $522,688 respectively on Sept. 30 of the previous year.

Files Lien for Unpaid Taxes of Gravel Firm

It is reported that a lien covering all property in the eastern Illinois district belonging to the Western Indiana Gravel Co. of Lafayette, Ind., was filed recently by the internal-revenue collector in the federal court at East St. Louis, Ill. This action was taken to recover $151,655 allegedly due as unpaid income taxes and interest over a period of six years.

International's Loss Approaches 1931 Profit

The International Cement Corp. reports for the quarter ended Sept. 30, 1932, a net loss of $519,424 after taxes, depreciation, interest, reserve for contingencies, etc. This compares with a net loss of $349,528 in the preceding quarter and net income of $531,480 equal to 83 c. a share on 636,171 no-par shares of common stock in September quarter of the previous year.

For the nine months ended Sept. 30, 1932, the net loss was $1,278,665 after charges and taxes, comparing with a net income of $1,532,107 equal to $2.41 a share on 636,171 shares in the first nine months of 1931.

The consolidated income account for the quarter ended Sept. 30, 1932, compares as follows:

	1932	1931	1930	1929
Gross sales	$4,166,368	$ 8,938,636	$ 9,638,985	$10,377,104
Expenses, etc.	3,344,935	6,873,986	6,759,010	7,662,534
Depreciation	955,087	1,004,923	880,634	863,371
Loss	$ 133,654	*$1,059,727	*$1,999,341	*$1,851,199
Interest, tax, contingencies, etc.	385,770	528,247	604,338	490,843
Net loss	$ 519,424	*$531,480	*$1,395,003	*$1,360,356

Nine months ended September 30:

	1932	1931	1930	1929
Gross sales	$11,274,825	$23,918,685	$25,930,394	$26,929,929
Expenses, etc.	9,425,679	18,671,513	18,794,638	20,104,104
Depreciation	2,113,293	2,307,748	2,160,579	1,932,654
Loss	$ 264,147	*$2,939,424	*$4,975,177	$ 4,893,171
Interest, tax, contingencies, etc.	1,014,518	1,407,317	1,528,411	1,365,407
Net loss	$ 1,278,665	*$1,532,107	*$3,446,766	*$3,527,764

* Profit.

Latest Portland-Cement Statistics

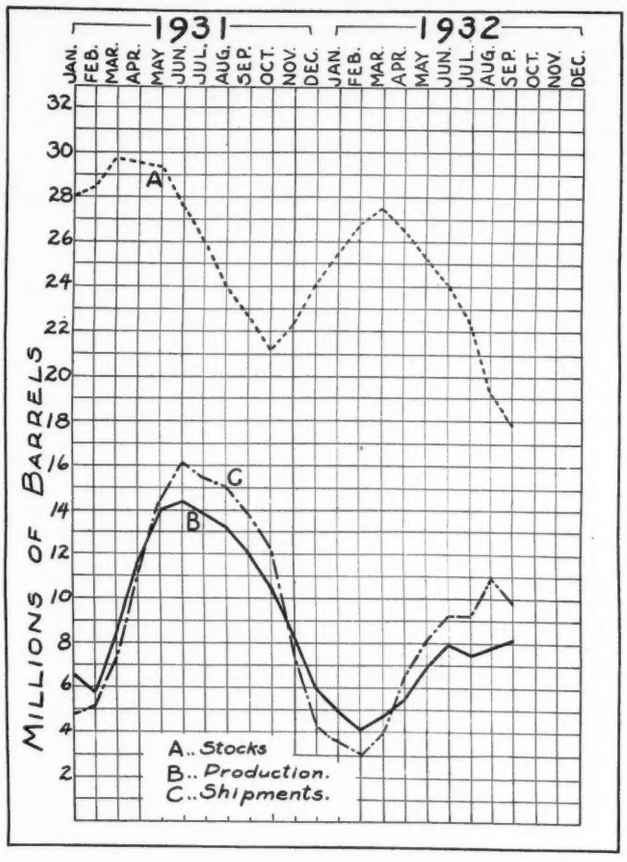

1931
1932
JAN. FEB. MAR. APR. MAY JUN. JUL. AUG. SEP. OCT. NOV. DEC.
JAN. FEB. MAR. APR. MAY JUN. JUL. AUG. SEP. OCT. NOV. DEC.
MILLIONS OF BARRELS
32 30 28 26 24 22 20 18 16 14 12 10 8 6 4 2
A
B
C
A.. Stocks
B.. Production.
C.. Shipments.

Chart showing monthly production, shipments and stocks on hand at end of month, from January, 1931, to September, 1932.

THE Portland-cement industry in September, 1932, produced 8,189,000 bbl., shipped 9,722,000 bbl. from the mills, and had in stock at the end of the month 17,865,000 bbl. Production of Portland cement in September, 1932, showed a decrease of 32.3 per cent. and shipments a decrease of 28.9 per cent., as compared with September, 1931. Portland-cement stocks at mills were 21.4 per cent. lower than a year ago. The total production for the nine months ending Sept. 30, 1932, amounts to 57,839,000 bbl., compared with 99,673,000 bbl. in the same period of 1931, and the total shipments for the nine months ending Sept. 30, 1932, amounts to 64,212,000 bbl. compared with 102,807,000 bbl. in the same period of 1931. The statistics here given are compiled from

DISTRIBUTION OF CEMENT

Shipped to—	July		August	
	1931	1932	1931	1932
Alabama	90,757	26,937	88,251	43,836
Alaska	2,716	2,442	1,666	1,570
Arizona	41,979	13,945	37,842	10,833
Arkansas	124,724	20,423	102,693	29,306
California	540,476	366,727	521,774	410,822
Colorado	73,107	45,274	77,569	58,040
Connecticut	166,381	80,902	159,855	100,729
Delaware	42,710	38,443	30,933	32,173
District of Columbia	126,637	87,905	122,153	109,666
Florida	106,826	37,770	68,905	49,148
Georgia	144,400	98,189	191,428	106,631
Hawaii	23,770	16,045	20,407	17,666
Idaho	22,930	8,961	23,842	10,689
Illinois	1,054,935	923,612	1,063,517	867,859
Indiana	682,234	482,652	592,825	557,005
Iowa	681,197	350,388	563,562	431,321
Kansas	198,757	88,175	242,108	91,387
Kentucky	202,923	117,036	186,726	205,040
Louisiana	505,614	97,884	498,824	167,844
Maine	86,427	80,949	75,516	77,546
Maryland	186,573	175,526	161,645	214,006
Massachusetts	377,774	272,853	332,816	308,259
Michigan	908,045	400,128	787,425	482,658
Minnesota	681,655	597,902	668,690	646,666
Mississippi	66,519	15,598	67,290	37,896
Missouri	439,866	478,055	483,764	471,862
Montana	32,722	15,319	34,859	19,274
Nebraska	281,405	48,233	319,336	96,855
Nevada	9,774	99,152	9,907	97,967
New Hampshire	63,680	17,092	78,995	29,829
New Jersey	519,732	282,170	550,716	342,947
New Mexico	21,853	11,869	20,056	11,438
New York	2,415,239	1,246,668	2,548,291	1,437,016
North Carolina	126,608	28,314	77,320	45,680
North Dakota	31,587	22,693	22,552	16,872
Ohio	869,396	539,371	700,988	774,702
Oklahoma	226,890	65,442	311,923	135,342
Oregon	102,903	56,746	93,759	63,606
Pennsylvania	807,513	451,127	869,155	604,752
Porto Rico	5,595	2,337	4,035	820
Rhode Island	57,157	33,395	59,797	31,578
South Carolina	151,919	24,879	141,224	22,402
South Dakota	101,420	27,280	95,711	32,468
Tennessee	110,542	90,884	119,876	89,977
Texas	588,163	331,951	562,895	392,333
Utah	42,650	10,745	24,194	25,011
Vermont	48,958	55,515	56,224	56,063
Virginia	178,952	72,801	146,156	115,664
Washington	265,116	119,136	223,760	168,362
West Virginia	179,975	89,286	166,437	93,479
Wisconsin	611,166	483,432	712,588	630,006
Wyoming	20,863	7,177	15,674	8,387
Unspecified	61,210	44,079	11,303	61,025
	15,512,920	9,201,814	15,149,757	10,944,313
Foreign countries	32,080	16,186	22,243	23,687
Total shipped from cement plants	15,545,000	9,218,000	15,172,000	10,968,000

RATIO OF PRODUCTION TO CAPACITY

	September		August	July	June
	1931 (*per cent.*)	1932 (*per cent.*)	1932 (*per cent.*)	1932 (*per cent.*)	1932 (*per cent.*)
The month	55.3	36.9	34.2	33.4	35.7
The 12 months ended	50.2	30.6	32.1	34.2	36.5

PRODUCTION AND STOCKS OF CLINKER BY MONTHS, IN 1931 AND 1932 (*thousands of barrels*)

Month	Production		Stocks End of Month		Month	Production		Stocks End of Month	
	1931	1932	1931	1932		1931	1932	1931	1932
January	8,129	6,107	10,384	8,184	July	12,246	6,613	10 209	7,889
February	7,473	5,176	11,946	9,375	August	11.664	7,078	8,468	7,202
March	9,586	5,443	13,318	10,025	September	10,414	7,709	6 918	6,742
April	11,540	5,924	13,854	10,511	October	9,825	.....	6,021	.....
May	13,159	6,273	13,087	9,922	November	8.259	.....	6,215	.....
June	12,679	6,803	11,837	8,877	December	6,840	.....	7,035	.....

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1931 AND 1932 (*thousands of barrels*)

Month	Production		Shipments		Stocks at End of Month	
	1931	1932	1931	1932	1931	1932
January	6,595	5,026	4,692	3,393	27,759	25,778
February	5,920	3,971	5,074	3,118	28,612	26,657
March	8,245	4,847	7,192	3,973	29,676	27,545
April	11,245	5,478	11,184	6,536	29,715	26,496
May	14,010	6,913	14,200	8,020	29,554	25,394
June	14,118	7,921	16,077	9,264	27,602	24,035
July	13,899	7,659	15,545	9,215	25,934	22,512
August	13,549	7,835	15,172	10,968	24,313	19,379
September	12,092	8,189	13,671	9,722	22,736	17,865
October	10,762	.....	12,360	.....	21,218	.....
November	8,161	.....	7,156	.....	22,219	.....
December	5,974	.....	4,142	.....	24,098	.....
Totals	124,570	.....	126,465	.....	.....	.....

PRODUCTION AND STOCKS OF CLINKER, BY DISTRICTS, in SEPTEMBER, 1931 and 1932 (*thousands of barrels*)

District	Production		Stocks at end of Month	
	1931	1932	1931	1932
Eastern Pa., N. J., and Md.	2,417	1,420	936	811
New York and Maine	987	608	315	440
Ohio, Western Pa., and W. Va.	822	735	868	638
Michigan	464	434	555	935
Wis., Ill., Ind., and Ky.	1,276	1,116	532	354
Va., Tenn., Ala., Ga., Fla., and La.	1,078	445	720	479
Eastern Mo., Ia., Minn., and S. Dak.	1,168	949	545	395
W. Mo., Neb., Kan., Okla., and Ark.	691	630	456	435
Texas	576	426	274	241
Colo., Mont., Utah, Wyo., and Idaho.	109	255	187	333
California	502	560	1,230	1,359
Oreg. and Wash.	324	131	300	322
Totals	10,414	7,709	6,918	6,742

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN SEPTEMBER 1931 AND 1932, AND STOCKS IN AUGUST, 1932 (*thousands of barrels*)

District	August						Stocks at End of August 1932
	Production		Shipments		Stocks at End of Month		
	1931	1932	1931	1932	1931	1932	
Eastern Pa., N. J., and Md.	2,761	1,606	3,108	1,683	5,422	3,903	3,979
New York and Maine	1,292	628	1,500	726	1,281	1,496	1,594
Ohio, Western Pa., and W. Va.	1,063	792	1,224	978	3,344	2,127	2,313
Michigan	743	524	807	849	1,908	1,273	1,598
Wis., Ill., Ind., and Ky.	1,623	1,255	1,995	1,706	2,648	1,492	1,942
Va., Tenn., Ala., Ga., Fla., and La.	1,069	394	1,032	457	1,725	1,370	1,434
Eastern Mo., Ia., Minn., and S. Dak.	1,228	1,039	1,341	1,524	2,361	1,892	2,377
W. Mo., Neb., Kan., Okla., and Ark.	701	698	886	698	1,305	1,531	1,531
Texas	625	427	688	315	539	717	605
Colo., Mont., Utah, Wyo., and Idaho.	171	216	224	188	541	509	482
California	529	499	593	433	1,050	1,079	1,014
Oreg. and Wash.	287	111	273	165	612	476	529
Totals	12,092	8,189	13,671	9,722	22,736	17,865	19,398

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1931 AND 1932

Month	Exports				Imports			
	1931		1932		1931		1932	
	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value
January	41,199	$115,678	36,704	$82,984	95,609	$120,298	14,375	$16,648
February	25,703	88,989	12,889	39,350	21,984	25,391	83,706	69,197
March	54,599	144,579	39,105	81,856	70,378	80,360	19,173	17,215
April	40,478	116,564	30,123	69,451	53,333	58,576	59,392	41,487
May	48,028	140,953	31,634	71,048	19,325	20,568	9,223	7,358
June	43,597	107,610	33,134	72,084	32,079	42,955	20,963	15,496
July	29,344	97,837	18,872	54,814	14,332	15,582	31,518	24,904
August	39,517	106,643	25,110	48,961	8,895	11,739	78,600	60,474
September	27,570	81,399	.....	.....	33,574	33,520	.....	.....
October	24,531	68,524	.....	.....	39,642	42,380	.....	.....
November	33,200	97,796	.....	.....	27,940	22,235	.....	.....
December	21,887	54,028	.....	.....	40,147	34,314	.....	.....
Totals	429,653	1,220,600	.....	.....	457,238	507,918	.....	.....

reports for September, received by the Bureau of Mines, from all manufacturing plants except five, for which estimates have been included in lieu of actual returns. In the statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 165 plants both at the close of September, 1932, and of September, 1931.

Traffic *(Continued from page 53)*

Tariffs 1-L and 4-I.—Docket No. 14,294.

[1] The car-load minimum weight will be 90 per cent. of the marked capacity of the car, except that, when the car is loaded to its full cubical or visible capacity, the actual weight will apply.

[2] The car-load minimum weight will be the marked capacity of the car, except that, when the car is loaded to its full cubical or visible capacity, the actual weight will apply.

QUESTIONS AND ANSWERS

Q. Some time ago we shipped a car of material on which we specified a certain route on the bill of lading. Now the consignee has been asked to pay additional charges on account of the rate not applying over the route we specified. Our local railroad agent quoted us the rate which was originally charged and did not know that it would not apply over the route specified. Under these circumstances can the additional charges be collected?

A. Assuming that your shipment moved interstate, that is, to a point in another state, the question of whether the additional charges can be collected depends on whether the rate quoted by the agent was inserted on the bill of lading or not. If the rate was not inserted on the bill of lading, the rate over the route you specified is the legal rate and can be collected. It is the duty of the carrier to obey the instructions of the shipper and if the shipper specifies the route the responsibility of knowing the tariff rate rests with him. Duluth Log Co. *v.* M. & I., 15 I.C.C. 627. If you inserted the rate quoted by the agent, on the bill of lading, it was the duty of the agent to secure information from you as to whether you wished to protect the route or the rate. His failure to do this renders the carrier liable for any damages which may result. Nebraska Bridge Supply & Lumber Co. *v.* C. N. O. & T. P., 136 I.C.C. 146. In this case the alleged undercharges could not be collected. In this connection it might be added that if neither rate nor route is inserted in the bill of lading, it is the duty of the carrier to route the shipment over the cheapest route.

Universal Resumes Work at Its Buffington Plant

The Universal Atlas Cement Co. resumed production at its Buffington, Ind., plant on Nov. 1 after having been closed since April 1 of this year. Depleted stocks and orders, on hand as well as expected, made resumption of production necessary. About 250 men were called back to work.

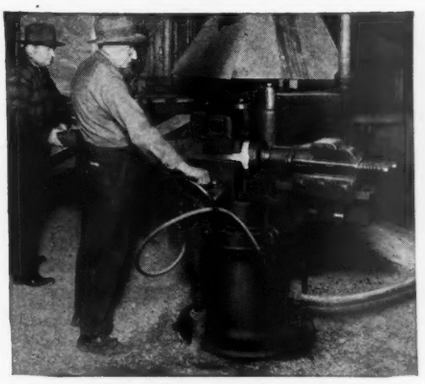
New Machinery and Supplies

New Machine Cuts Drill and Sharpening Costs

The WD sharpener has been announced by the Ingersoll-Rand Co., New York, N. Y. According to the manufacturer, actual reports from quarries indicate that the bits it produces effect a saving of from 50 to 61 per cent. in drilling costs and that these bits can be produced at a saving of 50 per cent. in sharpening costs.

New bits can be forged on blank steels in two or three heats, and dull bits can be redressed in one heat. The WD sharpener is claimed to make perfectly formed bits which are concentric with the steel and accurate in gage and in other details. Thus, an appreciable reduction is made possible in the number of stuck bits and crooked holes. Because of this, and because of the greater footage drilled with WD sharpened bits and the rapidity with which they can be resharpened, it is claimed that fewer steels per drill are required. The fact that bits can be made from blanks results in an additional saving in the purchase price of steel.

The WD sharpener embodies the same fundamental principles of design and operation that characterize the complete line of Ingersoll-Rand sharpeners which, for the past twenty years, have been fabricating drill bits for piston-type and hammer-type rock drills. The WD sharpener occupies small floor space. It operates entirely by compressed air, all operations being controlled by a single throttle in a convenient position. At all times the work is in view of the operator. A crosshead delivers the forging blows when forming the bit, and it clamps the steel while a dolly, actuated by a cylinder, rapidly forges the face of the bit. The drill bit is upset in a crosshead die, which firmly clamps the steel directly behind the bit. Water-channel swages are used to open the channel to the desired shape, thus eliminating the need of chipping or cutting away the metal.



Drill-bit sharpener.

Bits up to 9 in. in diameter on 6-ft. by 4½-in. steels can be made on standard WD sharpeners. Dollies can be furnished to make any desired shape of bit.

Oliver Offers D. L. O. Straight-line Drier

A new drier, known as the D. L. O. drier, is offered by Oliver United Filters, Inc., New York, N. Y., as exclusive distributor and licensor, and is built by the Sintering Machinery Corp. Operating on the principle of a straight-line traveling bed, the wet material is dried by controlled passage through it of heated air or gases. The D. L. O. drier reduces the moisture content, it is said, with operating costs thought unattainably low before. A D. L. O. drier installation handling up to 75 tons per hr. of washed bituminous-coal screenings has just made such a successful performance that the company operating this washery has ordered a second unit for prompt delivery.

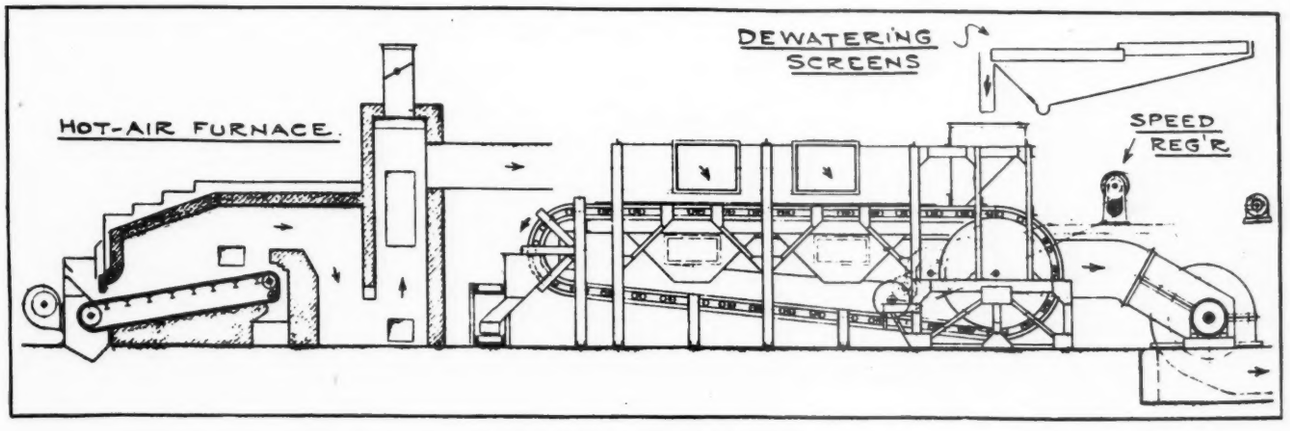
Dusting and the breakage of materials are claimed not to occur with the D. L. O. drier and its very low fuel rates are caused by the economical method of applying heat to the charge of wet material. Power used on the D. L. O. drier is said to be less than on rotary driers of similar capacity.

Improved Gas Engines Changeable to Diesels

An improved line of vertical 4-cycle gas engines, covering an unusually wide power range in a variety of cylinder combinations, has been announced by the Worthington Pump & Machy. Corp., Harrison, N. J. These units are built with from one to eight cylinders and from 30 to 150 hp. per cylinder, thus meeting all power requirements from 30 to 1,800 hp.

Many unusual details of construction are incorporated in these engines, among them being a mixing valve, common to all cylinders and adjustable through a single knurled handscrew, and employed on all but the largest units. Separate air and gas mixing valves—independently adjustable for each cylinder—are installed in each cylinder head of the largest engines. In all but the smallest units, air inlet and exhaust valves are carried in removable and interchangeable cages, the exhaust-valve cages being water-cooled; in the smaller engines, these valves (also interchangeable and adjustable) seat directly in the cylinder head and operate in removable bushings.

An attached reciprocating pump circulates lubricating oil through a cast-in duct in the base with cast-in branches leading to the bottom of each main bearing. Through drilled passages in the crankshaft and connecting rods, the oil reaches the crank and wrist-pin bearings under pressure from the main bearings. The camshaft gear, governor, and all other points requiring lubrication are supplied with oil under pressure from the flywheel end of the main oil duct.



Elevation sketch of new straight-line drier.

Two-point force-feed lubrication of the cylinders is employed on all but the smallest units.

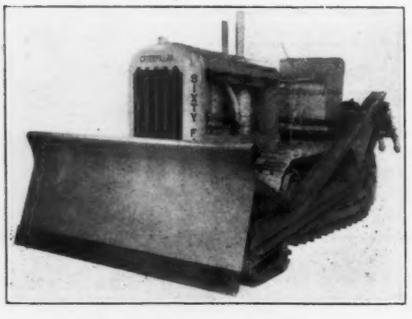
Readily removable at right angles to the engine, the cam-shaft is driven from the flywheel end by spur gears having silent spiral teeth. A tight cover incloses the entire cam-shaft assembly, including its lubrication. All essential points (including the exhaust manifold) are cooled, the principal feature being that the flow of water in all the jackets is so directed that high velocities result and there are no dead pockets. Both cylinder liners and heads are readily cleaned through large handholes, and unobstructed access to main and crank bearings is gained through large doors in the front and rear.

The manufacturers state that these engines can be readily converted into Diesels at moderate expense. Fuel pumps and spray valves replace the magneto (or battery) and spark-plugs; mixing valves are omitted; and Diesel cylinders, with smaller valves in the heads, are substituted. Hence these units need not be replaced when, for any reason, it becomes necessary or desirable to substitute oil for gas as a fuel.

Bulldozer Designed for Use With Caterpillar

A new hydraulic-operated bulldozer has been developed by the LaPlant-Choate Mfg. Co., Inc., Cedar Rapids, Ia., to be used on the Caterpillar "65" tractor. This bulldozer is ruggedly constructed and has been designed to have both up and down pressure on the blade. It has an extreme 34 in. high lift above ground level and an 18-in. drop below ground-level. It has been designed so the tractor drawbar is in the clear at all times, enabling the tractor to be used for hauling wagons, tampers, scrapers, etc., without removing any part of the bulldozer.

Special shock-absorbers are provided to absorb any sudden jolts before they are transmitted to the operating mechanism, thus minimizing the chances of breakage and assuring ease of operation. The bulldozer is hydraulically controlled, the control lever being placed within convenient reach of the tractor operator.



Hydraulically-operated bulldozer.

Cletrac Tractors With Compressors Available

The Cleveland Tractor Co., Cleveland, O., announces that air-compressors are now available for all models of Cletrac crawler tractors. The capacities of the compressors range from 120 cu. ft. for the Model 15 Cletrac to 640 cu. ft. for the Model

Tractor-mounted compressor.

80 Cletrac. Many advantages are claimed for tractor-mounted compressors. They make it possible to keep the air-supply at the work, long hose lines are eliminated, and the tractor can readily be driven out of the way when blasting. Such a unit can also be kept on the windward side of the work when drilling to keep the abrasive dust created out of the mechanism.

All of these tractors may be used with the air-compressors or the latter can be removed, leaving the standard tractor unit which can be used for other types of work. The design and method of mounting is such that the drawbar of the tractor is left free and the ability of the tractor to do hauling jobs is not impaired.

Photoëlectric Relay Is Designed for Counting

A new photoëlectric relay has been announced by the General Electric Co., Schenectady, N. Y. This relay is applicable to installations where practically complete interception of the light beam is made, since changes of light intensity of at least 50 per cent. are necessary for successful operation. The unit is particularly adaptable to counting applications, inasmuch as the sensitive relay contacts will handle directly the usual types of magnetic counters. The unit will operate on light impulses of 1/15 sec. duration. The relay should also find many applications in the limit-switch field.

The new relay, designated as the CR7505-Kl, consists of a phototube, a Pliotron amplifying tube, a sensitive relay, an adjustable potentiometer, and associated apparatus, all mounted on a steel base. It is used to control a circuit in response to an increase or decrease in the amount of light falling on the phototube.

The unit is complete in itself without an inclosing case, but a drawn-shell inclosure is provided to allow mounting on a vertical support. The base assembly may be removed from the case by unfastening two screws, although the unit may be wired and adjusted without taking it from the case.

A cover with one opening for the phototube and another for the potentiometer adjustment is provided with the unit. This cover is fastened to the case by means of a binding screw and dowel pins and is easily removed. The cover may be replaced by one with an optical system, should the application require it.

Where the interrupting capacity of the sensitive relay contact is not sufficient to handle the device to be controlled, a small contactor or magnetic switch may be interposed between the sensitive relay and the controlled device.

Motor Admits Air But Is Proof Against Water

The Louis Allis Co., Milwaukee, Wis., has developed a splash-proof motor to prevent entrance of water splashed with terrific pressure from any angle, yet adequately ventilated and built in the same dimensions as standard open motors.

A double baffle in an elliptical-shaped air passage in each end-bell provides the remarkable protection offered by this new and original motor. This unique construction, while allowing the free passage of ventilating air, traps and drains water splashed into the air openings at the bottom of the elliptical-shaped chambers. Another original feature is a shaft guard, which breaks the force of a stream directed along the shaft extension and prevents water from entering the bearing chamber.

Formerly it has often been necessary to protect open motors with sheet-metal covers which seriously restrict ventilation, or to install expensive fully-inclosed motors in which considerable condensation occurs when operated in moist atmospheres. The new Louis Allis splash-proof motor offers effective, economical, and practical protection in numerous applications where motors are subjected to splashing and dripping liquids or other falling particles—such as in sand-and-gravel pits.

Ventilated, splash-proof motor.

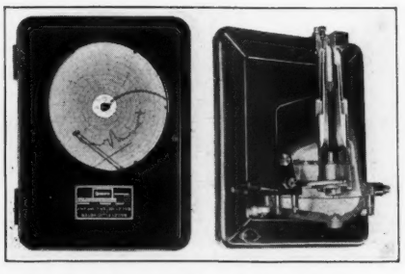
Fluid Meters Measure Steam, Water, Gas Flow

The manufacture of a new line of fluid meters for the measurement of steam, water, gases, and other fluids has been announced by the Bailey Meter Co., Cleveland, O. The new meters combine the qualities of high accuracy and dependability under severe service. Three general combinations of meters are available: (1) indicating and integrating; (2) recording and integrating; and (3) indicating, recording, and integrating. In the recording and integrating type the record is made in lb. per hr., gal. per min., or any other desired units on a 12-in. diameter, 24-hr. chart. Accurate analysis of the record is equally easy throughout the entire flow range, since the flow graduations are uniformly spaced. This feature also greatly facilitates comparison with records of pressure and temperature, which may be obtained on the same chart, when desired, by incorporating auxiliary recorders in the flow-meter casing. The total flow is given in pounds, gallons or other units by a 6-unit counter, which is located behind a small window in the meter name-plate. This may be read as easily as an automobile mileage register.

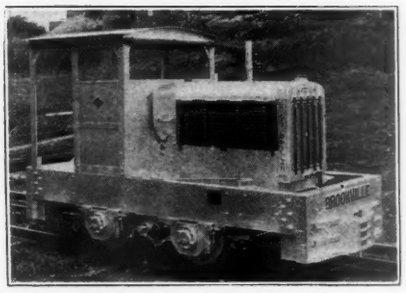
The flow mechanism is operated by the difference in pressure produced between the inlet side and the outlet side of the orifice or other primary element inserted in the pipe-line. The inlet, or higher pressure, is connected to the interior of the mercury-sealed Ledoux bell, and the outlet or lower pressure is applied to the exterior of the bell. The bell responds to changes in the differential pressure, and moves up or down as a frictionless piston, being shaped so that its vertical movement is directly proportional to the change in the rate of flow. Guide links direct the bell in a definite path, which is of particular advantage when the meter is used for marine service or as portable equipment. By means of a forked lever and spindle, motion of the Ledoux bell is transmitted directly to the recording pen and integrator. This bell, which makes possible the recording of the rate of flow directly on a uniformly-graduated chart, has played an important part for many years in the successful operation of Bailey mechanically-operated fluid meters.

The new fluid meters have a number of features which are particularly desirable. Permanent calibration is assured, since adequate protection against sudden surges or reversals of flow is provided. The cases have been arranged to allow mounting either on the surface of a wall or panel, or flush on a panel as desired. Auxiliary recorders, such as for temperature, pressure, vacuum or draft, may be easily installed in the case to give a record of these factors on the same chart with the rate of flow. Meters are available for use under any commercial operating pressure.

Throughout the mechanical construction of the meters, every effort has been made to produce a finished product which will give long trouble-free service with the minimum attention. The pressed-steel case, for example, is moisture- and dust-proof. There are no moving parts which require oiling or greasing. The use of a Warren synchronous motor for driving the integrator and chart eliminates the necessity of winding a clock. Each part is made of material most suitable for the service, therefore many special metals are employed, such as specially heat-treated aluminum, monel, magnesium, cadmium-plated brass, tungsten carbide, KA2 Enduro, and stainless steel.



Outside and inside of fluid meter.



Locomotive using gasoline power unit.

Caterpillar Engines in Brookville Locomotives

The Brookville Locomotive Co., Brookville, Pa., has just announced the standardization of Caterpillar engines for its larger sizes of locomotives. The business arrangement insures prompt shipment of any size of locomotive from 6-ton to 12-ton, and guarantees the engine service for which Caterpillar dealers are known.

Allis-Chalmers Tractor Uses Pneumatic Tires

The Allis-Chalmers Mfg. Co. is introducing a new Model U air-tired tractor with slow speeds for heavy duty and a road speed of 15 mi. per hr. Simultaneously, the Goodyear Tire & Rubber Co. has begun production of tractor tires to be used with an air pressure of only 12 lb. per sq. in. Greater speed, more cushioning, and lower operation and maintenance costs are claimed. New steel wheels for these tires are now being offered by French & Hecht.

Goodrich Puts Rubber Tires on Wheelbarrows

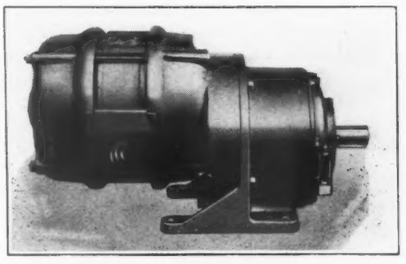
Engineers of the B. F. Goodrich Co., Akron, Ohio, have designed low-pressure tires for wheelbarrows, it is announced. The new tires, patterned after airplane casings, constitute one of the few major changes made in wheelbarrow construction in many years. With low-pressure tire equipment it is possible to use wheelbarrows in mud and deep sand, where the old-type wheels found motion difficult if not impossible. The manual effort required to push a wheelbarrow is considerably reduced when low-pressure tires are used, Goodrich tests showed. Breakage, in many industries where this is a major problem, is also greatly reduced by use of rubber tired equipment.

Gear Reduction Unit Integral With Motor

The Ideal Electric Co., Mansfield, O., has developed a series of geared motors which have a gear reduction unit built integral with the motor. No motor coupling is used as the high-speed gear is mounted directly upon the motor shaft. These units are available in all gear ratios from 2.09 to 1 up to 376 to 1, giving output speeds of from 86.1 r.p.m. to 4.7 r.p.m., using the standard 1,800-r.p.m. motor supplied with these units.

For reduction ratios up to about 6 to 1, the reducer consists of a single-stage helical-gear unit. For higher ratios up to and including 24.5 to 1, a two-stage helical-gear reducer is used. For reduction ratios of 30 to 1 and higher one stage of helical and one stage of heliocentric gears gives the required reductian. All gears run in an oil bath and anti-friction ball- or roller-bearings are used throughout. The units employing heliocentric gears have the motor hung on the reducer, while other units have the reducer hung on the motor.

Geared motors are supplied in all horsepowers from ¾ to 20. Either open- or inclosed-type motors are furnished, for 2- or 3-phase alternating current or for direct current. The motors are the recently developed Ideal unit-type construction with feet on the end brackets and with standardized rotors and stators which are interchangeable throughout all types. Two, three, or four-speed motors can also be supplied.



Motor with integral speed-reducer.

Geared Drive-Link for Double-Roll Crushers

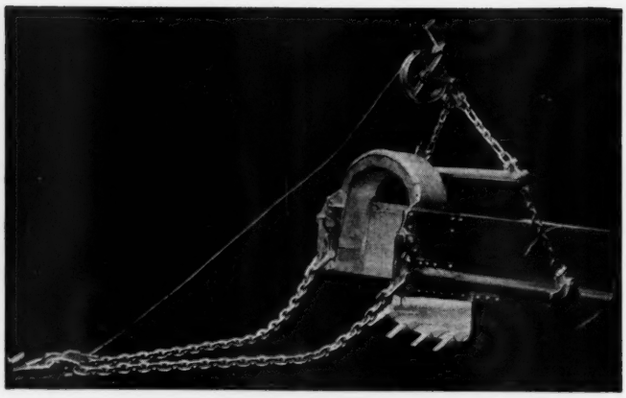
The F. M. Welch Engineering Service, Greenville, O., has developed a new driving arrangement for double-roll crushers consisting of a geared driving link. This method was developed in adapting a roll-crusher to meet certain requirements in one of the plants of the American Aggregates Corp. It consists of a link connection between the two roll shafts which are geared together by two intermediate gears. Different roll settings can be made for different sizes of products and to compensate for wear without disturbing the mesh of the gears.

The crusher may be driven from either shaft, and different gears may be used to vary the roll speeds. The design lends itself to any amount of power or any relative speed between the two rolls and the wear is said to be no greater than that in an ordinary speed-reducer. The entire unit is inclosed in a housing or gear-case. Patents on this arrangement are now pending.

Many Improvements in Bucket for Drag-lines

The Wellman Engineering Co., Cleveland, O., builder of Williams buckets, has developed an improved type "DL" drag-line bucket designed to withstand severe service and incorporating many improvements which should be greatly appreciated by the users of this type of equipment.

This improved bucket has welded stiffeners extending the full length of the bucket on the outside, interlocked with the bail attaching brackets, a cantilever type of construction which, it is claimed, prevents the pulling-in of the lower front corners. A quick-opening hinged hitch allows the use of a solid one-piece attaching clevis, which enables the operator quickly to set the drag-chains at the best digging angle for the kind of work to be done. The side-walls are reinforced with an angle welded to the plate between the arch and back strap, and the special box-section steel-casting arch is designed to withstand the severest pounding of drag-line work. It is fitted with Williams patented teeth having reversible points, the lip is of special heat-treated steel, it has the tubular design of spreader-bar with new end fittings, and also a special 3-way swiveled link and improved sheave block.



Drag-line bucket of improved type.

Another distinctive feature are the wearing shoes, which are forged or welded to the sides of the contacting chain links, for bearing against wearing strips provided on the sides of the bucket. This construction is said to overcome the rapid wearing of the links and the breaking of chains at these points, which are often sources of annoyance and delay.

One other feature is the drag-cable socket which has two hooks, or spurs, on the inside for attachment of the rings at the front ends of the main drag-chain. Since these rings are attached to the spurs, any wear will take place between the casting and the rings and none will occur on the pin. The former construction carried the ends of the chain directly on a pin which tended to wear rapidly and eventually break by bending. All these features have been incorporated without increase in weight, making this bucket extremely rugged and durable. These buckets are now built in sizes ranging from 1¼ to 3 cu.yd. rated capacity.

Constant-Weight Feeder Announced by Hardinge

The Hardinge Co., York, Pa., has developed the new types E and F constant-weight feeders designed to take feed as large as 2 ft. in diameter and to prevent clogging in the bin. Like the other types of Hardinge constant-weight feeders, these measure by weight and not volume, one advantage being that a record of the weight of the material fed can be made at the beginning of plant operations. The feeder is claimed to be 99 per cent. accurate. It consists of a traveling belt mounted on a frame on which the driving mechanism is also located. It is so suspended that any variation in the weight of the belt opens or closes the feed gate. A constant feed is maintained regardless of changing conditions.

Ingersoll-Rand Now Sells SKF Drill Steel

The Ingersoll-Rand Co., New York, N. Y., has acquired exclusive rights to market SKF drill steel throughout the world. The product is being sold under the trade name IR-SKF. This brand of steel, which is claimed to be of unusually high quality, was developed as a result of exhaustive tests and experiments by the technical departments of Ingersoll-Rand Co., in collaboration with the SKF mills.

The high power and fast speeds of modern rock drills require a high-quality drill steel with long fatigue life to resist breakage and to give fast cutting power. It is said that IR-SKF steel meets these requirements and that at the same time it is easy to shape and sharpen and that it will hold its cutting edge and gage through a long period of service.

IR-SKF steel is available for immediate delivery in all standard sizes and sections in both solid and hollow forms. The hollow steel is made by the SKF "supersmooth" hole process, which is claimed to produce an absolutely uniform hole throughout the length of the steel.

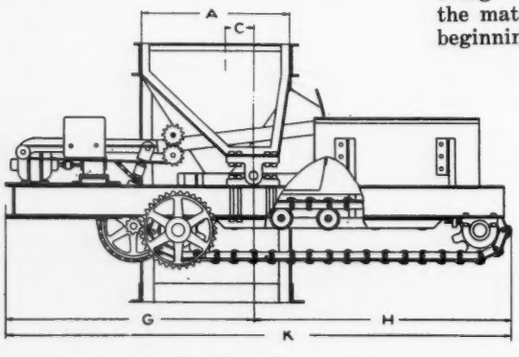
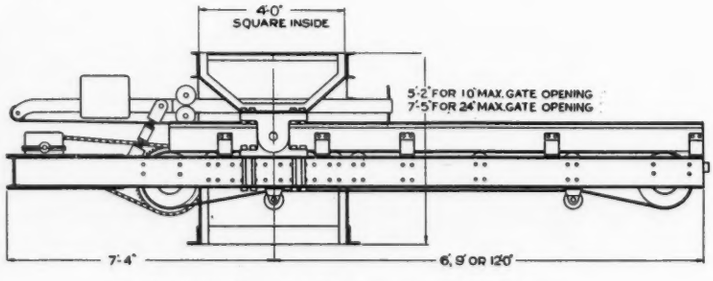


TABLE OF DIMENSIONS

SIZE	A	B	C	D	E	G	H	K
2½2	2-0	2-0	8"	5-0	5-0	4-0	7'-4"	12'-4
4½4	4-0	4-0	8"	5-0	5-0	6-0	7'-4"	13'-0



Two types (one at left) of constant-weight feeders.

Manufacturers' Publications

Copies of any of these publications may be had by writing the manufacturers who publish them. Please mention PIT & QUARRY *when writing.*

Belting

Short Cuts to Power Transmission. (11th ed. Flexible Steel Lacing Co., Chicago, Ill.) A handbook for belt users describing various types of belt fasteners. Also gives considerable information on the use of belts for different purposes.

Buckets

Drag-line Buckets. 4 p. (Wellman Engr. Co., Cleveland, O.) Bulletin describes and illustrates the improved Williams "DL" drag-line bucket which is said to be stronger and lighter than earlier models.

Boilers, Miniature

Electric-Heated Miniature Steam Generators. 4 p. (Bull. 52. Commonwealth Electric & Mfg. Co., Boston, Mass.) Describes and illustrates a new line of miniature steam generators, electrically-heated in 2-, 3-, 4-, and 5-kw. sizes. The company's complete line includes steam generators or boilers from 2- to 90-kw. capacity.

Conveyors

How Shall We Handle It? 24 p. (Diamond Rubber Co., Akron, O.) Illustrates the adaptability and versatility of the belt-conveyor for specific plant problems and the use in various industries is described.

Crushers

Superior McCully Crushers. 24 p. (Bull. 1472. Allis-Chalmers Mfg. Co., Milwaukee, Wis.) Profusely illustrated bulletin describing in detail the features and construction of the various sizes of Superior McCully gyratory crushers.

Engines, Gasoline

Gasoline Engines. 4 p. (Cushman Motor Works, Lincoln, Neb.) Describes and illustrates the various types of gasoline engines made by this company in sizes of from ¾ to 20 hp.

Light Plants

Electric Light and Power Plants. 4 p. (Cushman Motor Works, Lincoln, Neb.) Describes and illustrates various types and sizes of gasoline-engine-driven electric-light and power plants, ranging in size from 500-w., 32-volt to 1,500-w., 110-v. units.

Locomotives

Brookville B-I-30 Gasoline Locomotives. 8 p. (Bull. B-29. Brookville Locomotive Co., Brookville, Pa.) A well-illustrated bulletin giving a complete description, with photographs and illustrations, of the Brookville B-I-30 series of locomotives, which are powered with the new I-30 McCormick-Deering industrial-tractor engine. These are made in all gages and in 4-, 5-, 6- and 7-ton sizes.

Meters

Fluid Meters. 24 p. (Bull. 300. Bailey Meter Co., Cleveland, O.) Describes and illustrates various new types of fluid meters and their distinctive features, applications and methods of installation. Illustrated with drawings, sketches, photographs and charts in four colors.

Motors

Electric Motors. 8 p. (General Electric Co., Schenectady, N. Y.) Describes and illustrates application of various types of electric motors to different uses in nonmetallic-mineral plants.

Power Transmission

Cog-Belt Drives. 32 p. (Catalog No. 105. Dayton Rubber Mfg. Co., Dayton, O.) A new condensed catalog for office files or catalog binders giving complete prices, dimensions and simplified data for the calculation of special drives. A card for determining the cross-section of a belt is included.

Day-Steel Pulleys. 4 p. (Dayton Rubber Mfg. Co., Dayton, O.) A bulletin describing Day-Steel pressed-steel pulleys for Dayton Cog-Belt drives. Accurate balance, a substantial reduction in weight and long life are claimed for this pulley. A table gives all ratings for 7½ hp. or less.

Pumpings from the Old Pit

Fifteen Years Ago

PIT AND QUARRY announced the adoption of the monthly plan of publication to begin in the following January. Prior to that time it had been issued bi-monthly.

* * *

New companies entering the industry included the Valley View Lime, Clay & Coal Co., Sugar Creek, O.; Broadway Sand, Gravel & Art Stone Co., Cleveland, O.; Universal Sand Co., Newcastle, Pa.; Newpoint Ground Limestone Co., Newpoint, O.; Centlivre Sand & Gravel Co., Anderson, Ind.; Consumers Gravel Co., Detroit, Mich.

Ten Years Ago

THE contract for the state-owned cement plant to be built at Rapid City, S. D., was awarded to J. C. Buckbee & Co., engineer, Chicago. It was stated that the plant would cost $1,300,000 and that work would be started as soon as conditions allowed.

* * *

Geo. D. Van Sciver, president of the DeFrain Sand Co., was building a 3-mi. private railroad at a cost of $250,000 from his sand and gravel pits at Morrisville, Pa., to Delaware River. This railroad was built to deliver materials to barges for shipment to various river and ocean ports at a saving compared with the railroad-freight charges.

The Lehigh Portland Cement Co. of Allentown, Pa., had acquired a limestone deposit at Tarrant City near Birmingham, Ala., with the intention of erecting a 1,000,000-bbl. cement plant on the property.

* * *

Announcement was made that the constitutional convention of the National Assn. of Sand & Gravel Producers, postponed from September, would be held Nov. 15, 1922, at the LaSalle Hotel, Chicago.

Five Years Ago

WORK was under way on the new $1,500,000 cement plant of the Volunteer Portland Cement Co., at Knoxville, Tenn. The plant was expected to be in operation about April, 1928.

* * *

The Pratt Rock & Gravel Co. purchased the plant of the American River Sand & Gravel Co., at Mayhew, Sacramento Co., Cal. This property contained deposits estimated to contain more than 2,500,000 tons of sand and gravel.

Saving Through Safety

Plant Yard Presents Many Accident Hazards

By G. M. BRIGGS
National Safety Council

ALTHOUGH injuries may be less frequent in the plant yard than in other departments, they are likely to be severe. Such injuries are not limited to yard workers but many happen to workers of other departments passing through the yard, to truck drivers of outside companies, to railroad switchmen, and to others.

The yard foreman, therefore, is responsible not only for the safety of his own men, but also for the safety of all who come into the yard. He should be a true convert to the plant accident-prevention program and an unswerving advocate of safe practices.

Although machinery of various kinds may be in or may cross the plant yard—notable examples being the traveling crane and the conveyor system—machine accidents will be rarer than other kinds. More often the yard accident will be traced to a violation of safe practices, to falling or being hit by a falling object, or to one of the many ways in which railroad or automobile traffic takes its annual toll.

According to the Portland Cement Assn., its 1930 reports covering 128 plants showed that 11.2 per cent. of all lost-time injuries and 12.4 per cent. of the actual time lost because of such injuries were charged against the yard and railroad departments.

It is essential, first, that the plant yard be laid out with careful consideration for the location of passageways, roadways, tracks and their extensions. Separate entrances and exits should be provided, if possible, for pedestrians, for vehicles, and for cars and locomotives. Railroad gates should be of such width that switchmen will not be caught between the cars and the gate-posts; if such space is not provided a sufficient warning sign should be prominently displayed.

If the view is obstructed or the traffic heavy, a watchman should be stationed at the gates. At some plants an electric gong is sounded when cars are about to pass through. Railroad entrance gates should never be used by pedestrians, for sooner or later a fatality or serious injury is bound to occur. Where the door from any building opens, unavoidably, close to railroad tracks, a railing should be erected making the employee stop and pass around the obstruction before crossing the track.

"Danger" or "Crossing" signs should be placed at all crossings and other danger points along railway tracks or vehicular passageways in the yard. Many plants eliminate crossing of vehicular and pedestrian passageways by overhead or underpass lanes.

Railroad tracks are usually a continual source of tripping and falling accidents, due to poor construction and poor maintenance. Ties should be laid on a solid foundation with the base material banked up well around them. This prevents the ties from sinking or shifting sideways, and considerably lessens the tripping hazard. Rails should be of good metal, free from defects.

Switch stands should be placed at a sufficient distance from the tracks to insure clearance for trainmen. The switch levers should be of a type that throw parallel to the track. All frogs, switches, and guard rails should be properly protected by the use of suitable blocking to prevent a person catching his foot at these points.

The stub ends of all spur tracks should be provided with substantial bumping blocks. Piles of dirt, ties laid across the tracks, or other makeshifts are unsuitable and should not be used. Heavy concrete or sound, well-seasoned hardwood posts, securely anchored and equipped with proper metal face plates, make substantial bumping blocks. The anchorage should never be made to the rails. It should be a strictly enforced rule that cars are not to be dropped against the blocks. Always stop the car with a margin of room between the post.

Derailers should be used on sidings, particularly those located on a grade. When cars, either empty or loaded, are "spotted" on elevated tracks, the brakes should be set securely and the wheels blocked.

Special precautions must be taken when tracks are run on trestles or over bins. The supporting structure should be strong enough to withstand not only the weight of standing locomotives, cars and loads, but also the vibration and strain imposed when the cars are moved. Footwalks with hand-rails and toe-boards should be provided on both sides of the track for the entire length of the trestle and the spaces between the tracks should be fully covered. The footwalks must be kept free of wrenches, loose boards, or other materials which may cause one to stumble.

At least twice each year an inspection should be made of all wooden trestles for defects in the woodwork. Termites will attack wood, leaving the outer shell almost unharmed, although the interior may be eaten away. Termites leave evidence of their activity in the form of little piles of dust-like material; when these are discovered adequate measures should be taken at once to strengthen the structure.

The termites may be destroyed by certain metallic salts that are soluble in water and easily prepared for wood-preservation treatment. Among these salts are mercury chloride, zinc chloride, sodium fluoride, and copper sulphate. Men treating timbers with these solutions should wash their hands thoroughly before partaking of food. Containers in which the salts are kept should be plainly marked "Poisonous."

Men may often be endangered in the plant yard by falling materials, particularly where grading or excavating work is carried on with steam shovels or cranes. In addition to the hazard of material falling from the buckets, there is the movement of the shovel as the work progresses and the shifting of the trains to remove material as the cars are loaded. If scoops with horses or tractors are used, there is danger of the scoop catching and throwing a man, or of his hand or foot catching between the scoop and some other object.

There is also the danger, in many types of yard work where lifting is to be done, of a man attempting to lift too much, or, more often, of a strain being suffered through ignorance of the best way to lift a load. Loads should be lifted with the full coöperation of the muscles of the legs, back and arms, all working together; first squatting down and then lifting straight up in as nearly an erect position as possible. To bend over a heavy object and attempt to straighten up while lifting chiefly with the muscles of the back and arms is to invite disaster.

No excavation over 4 ft. deep in the plant yard should be made (for sewer, drain or pit) without careful shoring of the sides to prevent a cave-in upon the men. In making any excavation care must be taken to see that the men are placed so that they will not endanger each other with their tools. The use of modern ditch-diggers, back-fillers and derricks will reduce many hazards usually encountered by hand labor. No excavation should be left overnight or for any appreciable

time during the day without adequate warning signs, and frequently the only adequate protection for the unwary is a railing completely around the pit.

Experience has shown that safety posters and various other safety signs about the plant yard are just as effective as in other departments in preventing accidents. In the yard they have an additional advantage, in that they may be made large and conspicuous. The foreman's instructions upon all safe practices should be supplemented with plenty of posters and with such other bulletins as will keep his men "safety conscious." The man who is continually reminded of ways to prevent accidents will react to safety teaching readily.

No employee, except members of the train crew, should be permitted to ride on the rolling stock without express permission of the proper official and then only in case of necessity. Promiscuous riding of this kind should not be tolerated. It is far better to discharge a man than to be required later to inform his family of his injury or death.

A wise rule enforced by some companies is that no man shall be allowed to ride on the forward running board of a locomotive. Riding on the rear running board between cars also should never be allowed; there is always danger of derailment, or of a misstep with resulting serious injury. To go between the cars to make a coupling, or to kick a coupling into position, is likewise a dangerous thing to do. Men should use the lever provided at the side of the car for coupling purposes. In case the standard coupling is not provided, a stout stick should be used to guide the link and pin into place.

Where possible, the switching about a plant yard should be planned so that it will not be necessary to perform such work at a change in gang shifts or at noon time, when many men are likely to be using the crossings or otherwise passing about the plant yard.

Both locomotive cranes and steam shovels present many hazards that must be guarded against through expert knowledge of their operation. Many men have been seriously injured or killed when caught between the crane body and the truck bed.

Locomotive-crane operators should move the crane only on the signal of an authorized person. Operators should not load or unload material when a man is in the car. When it is necessary to guide the bucket or material it should be done by a person standing at a safe distance. Care must be exercised when passing corners of buildings to see that the crane and boom are parallel with the track, well away from the building structure. The greatest care must also be taken when the crane is passing under overhead wires.

The subject of chains, cables, ropes, hooks and slings is a voluminous one in itself, and the safety of these articles is an important one for the yard worker. The abuse of chains is one of the chief reasons for their failure and resulting injury to the employee.

The plant yard should be kept in as neat and orderly condition as possible. Particular care should be taken to see that loose boards, pipes and other materials are not left lying about promiscuously. At convenient places about the yard there should be boxes or barrels into which may be thrown pieces of scrap, wornout tools, glass, and other waste materials. These containers should be emptied often and their contents properly disposed of.

Many serious injuries have occurred to railroad-department men because of stumbling over loose material or refuse near or on the tracks. Such injuries may be avoided by careful inspection and proper maintenance of the ground between and near the railroad tracks.

During winter months many accidents are caused by the slippery condition of walkways, especially at building entrances. One or more men should be delegated to remove snow and ice, or to spread cinders or sawdust on sleet-covered walkways. These men should also break down the icicles over doorways and other places where their falling would cause injury to passers-by as well as workmen.

*Accident Prevention in the Cement Industry**

By A. J. R. CURTIS
Assistant to General Manager
Portland Cement Assn.

THOSE who have a memory for figures may recall that throughout the cement industry accidents have declined steadily since 1924. For the mills within the membership of the Portland Cement Assn. the lost-time totals (including fatalities) have been as follows, beginning with that year: 3,134, 2,609, 2,219, 1,370, 913, 723, 419, and 226. While conditions represented by these successive figures are not strictly comparable, because of the variation in number of the operating units and the man-hours worked, the important fact is that the trend continues rapidly downward.

A more accurate picture may be obtained by examining the combined record of the group of 65 identical mills which have reported continuously throughout the period of the last eight years. During 1924 this group suffered 1,750 lost-time accidents; during 1931, 162 similar mishaps, or about one-eleventh as many. In this group the average number of accidents per plant dropped from 27 in 1924 to 2.5 in 1931, the latter rate being about one-eleventh of the former. The total man-hours of employment in this group in 1931 was only 46 per cent. of what it was in 1924, yet the number of accidents per 1,000,000 man-hr. had dropped from 30 in 1924 to 6.2 in 1931, a reduction of 79 per cent. Had accidents in this group occurred at the rate of 30 per 1,000,000 man-hr. in 1931, their total number would have been 788 instead of 162.

Examining a larger group of 79 plants (including the former 65) which have reported steadily for the five years, 1927 to 1931, we find that these mills suffered 1,412 lost-time accidents in 1927 and only 207 in 1931, about one-seventh as many. The average number of accidents per plant was 17.8 in 1927 and 2.6 in 1931, also about one-seventh as numerous. Accidents per 1,000,000 man-hr. declined from 26.2 to 6.40, or 76 per cent. At the 1927 man-hr. rate 846 accidents would have occurred in this group in 1931, instead of 207.

In 1924 the per-plant accident rate for the entire group of 110 plants which reported that year was about 28.5. Had that rate per plant persisted in all the plants reporting during the years up to 1932, there would have been a total of 17,569 more lost-time accidents than actually occurred. Had the number of accidents per 1,000,000 man-hr. obtained in the entire group in 1924 been continued by all the plants reporting during the years up to 1932, there would have been a total of 11,324 more lost-time accidents than actually occurred.

The reduction in fatal accidents has been especially gratifying. In 1924 there were 76 fatalities, in 1931, 18. Weighing all the factors involved, we believe that the accident-prevention campaign carried on during this period has reduced the number of fatalities by at least 250.

For a number of years, as our accident totals have declined rapidly, the relative proportion of these totals suffered by the several main divisions of the plant organizations have remained fairly constant. At least there has been no marked departure from the general rate of decline in accident frequency. This fact would argue quite conclusively for the effectiveness of our present plans and methods, all which focus on the education and training of the personnel rather than on operating methods, processes, or equipment. Rather than a new concept or a new plan, what we need, obviously, is to put more "punch" into our safety work and to pursue it with greater thoroughness.

New elements are entering our operating situation. Plants are working shorter shifts. Some operate on a short-week basis. Of economic necessity many men are required to double up on jobs. Low price trends have forced fewer man-hours per barrel. Operating men are assuming greater responsibility. Hazards are concentrating. Our old equilibrium of operating conditions has been upset

* Address before the Cement Section of the 21st Annual Safety Congress.

and a new equilibrium will be established. Will our old principles and methods apply? We believe that they will, in the main, the only real points of difference being that the present situation calls for greater intensity and thoroughness.

In come cases mill organizations have been entirely broken up and with the returning prosperity we hope for, these will have to be rebuilt. In others safety committees and first-aid teams have been discontinued and will have to be reorganized. Meetings dropped for the time being will be resumed. Other functions temporarily abandoned or allowed to lie dormant must be restored to vigorous life and full usefulness.

This means that the old interest must be rekindled, the old zest for accomplishment stimulated, all the old-time ingenuity in planning and executing various features of the work called back into play.

Can we rebuild as well as we built our safety structure originally?

I have referred to the necessity for thoroughness in order to meet the situation with which we are now, or shortly will be, confronted. The following fourteen paragraphs, most of them in the form of questions, group subjects on which definite detailed information should be obtained by the plant superintendent, safety director, and safety committee, as a basis from which to proceed. They are as follows:

1. Are your plant inspections being maintained regularly and with thoroughness? How often are inspections made, by whom, and are written reports being submitted? If so, by whom are they being scrutinized?

2. Are safety-committee meetings being held with accustomed frequency during operating periods?

3. If your mill has been down over an extended period, was the safety committee disbanded and, if so, have steps been taken to reorganize it with the reöpening of the mill?

4. Is the Portland Cement Assn.'s monthly statement of significant accidents being received by all your department heads, and are all pertinent accidents read to their men?

5. Do you obtain and make use of the Cement Section News Letter in the same way?

6. Are minor accidents being recorded as carefully as lost-time accidents, filling in all information requested on the forms, so that reports of these trivial mishaps may be used to ward off more serious accidents in the future?

7. Is every lost-time or significant minor accident investigated? If so, by whom? Is a written report filed? If so, does it invariably make recommendations by which, it is believed, recurrence of the same accident will be prevented? Does your superintendent see all accident reports and review the file before it is closed?

8. An accident-report file should never be closed until: (1) the safety committee and the superintendent feel sure that real cause of the accident has been discovered, (2) a method of avoiding a recurrence has been found, (3) necessary changes, assuring safety committee and superintendent that that accident can not happen again, have been made.

9. The treatment of the accident report prescribed above may also be applied to accidents reported in Significant Accident Bulletin.

10. What is the present status of first-aid training in your mill? What proportion of your force is now competent in resuscitation and other first-aid work? What means of instruction or practice is afforded? Do you maintain one or more teams?

11. If you feel that your organization is "slipping" in first aid, would you like Bureau of Mines help? If so, about how soon?

12. Do your men need safety reading matter? Have any of them prepared safety papers or speeches recently?

13. Are there any signs that your men are losing interest in safety work? Are you training any new men you may take on as faithfully as in the past? What are you doing about physical examinations?

14. Are your safety committee and superintendent now preparing an adequate safety program for 1933, with features that will cover every week and day and call into service every employee?

If throughout our industry, safety work were now being done with a degree of thoroughness suggested by consideration of these fourteen paragraphs, we could dispense with any fear about our ability to meet the exigencies ahead.

The Signal Mountain Portland Cement Co., Chattanooga, Tenn., started up its plant on Nov. 1 after having been shut down since January.

Plant Shows Profit on 35-Ton-an-Hour Output

The Langley Brothers Quarry Co., Emporia, Kan., operates a new crushed-stone plant which, it is said, enables it to produce at a profit even under existing conditions. This plant, which was designed by the Gruendler Crusher & Pulverizer Co., has a capacity of 35 tons per hr. The product of the plant is being used on a relief program which is giving employment to 50 men.

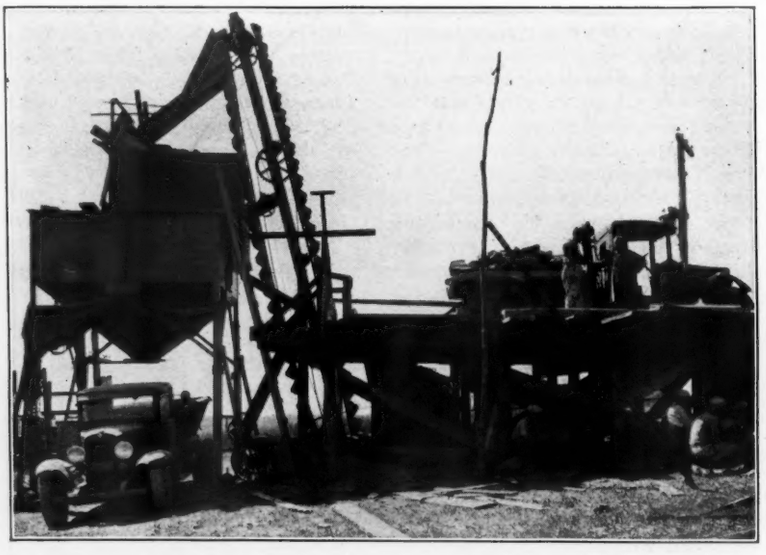
The stone is hauled from the quarry to the plant by trucks, which discharge from a timber ramp directly into the Gruendler heavy-duty hammer-mill. This discharges directly to a continuous belt-bucket elevator which feeds through a chute to a shaker screen. The sized stone drops into the telescopic steel bin which supports the screen. Trucks are loaded through a sliding gate under the bin for haulage to the job.

A Correction

In an article published in the Oct. 5 issue of PIT AND QUARRY and describing the skip hoist used by the Big Bend Quarry Co., St. Louis, it was stated that the new rope used was furnished by the Broderick & Bascom Rope Co. of that city. This is true, but, according to the A. Leschen & Sons Rope Co., of St. Louis, most of the rope used on this skip was of its "Hercules" brand.

Birdsboro Buys Crusher Business of Buchanan

The Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., has taken over the full ownership and direct management of the C. G. Buchanan Co., 90 West St., New York, N. Y. This office is retained and is under the management of Geo. H. Keppel.



This Emporia, Kan., plant produces 35 tons of stone an hour and operates at a profit.

Eighteen tons per hour from a No. 19 Crusher–100% through three-eighth inch opening using less than fifteen horsepower

THE following is the result of a test on a No. 19 Kennedy Ball Bearing Gearless Crusher.

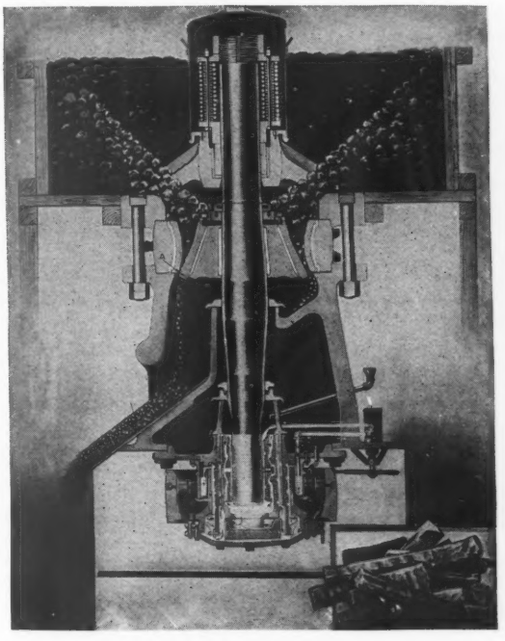
Exceedingly hard glacial gravel, 1½" and plus ⅜", was crushed for sand for concrete purposes, and less than fifteen horsepower was used.

The same crusher can be opened up and 1½" stone can be produced at a rate of from 30 to 50 tons per hour.

With the opening set to ⅛" on the closed side the following results were obtained:

Minus ⅜"	100 %
Plus 3 mesh	21½%
Minus 3—Plus 4	17 %
Minus 4—Plus 14	36½%
Minus 14—Plus 48	15 %
Minus 48—Plus 100	4 %
Minus 100	5½%

This was crushed at the rate of 18 tons per hour.



Built in various sizes with receiving openings from 1¾" to 14". Produces sizes from ⅛" to 3", with capacities up to 620 tons per hour on the larger sizes.

The Kennedy Ball Bearing Gearless Gyratory Crusher is guaranteed to do more crushing, size for size, of any given material, with less power consumption, than any crusher ever built. 90% Of the power input to motor is applied direct to breaking the rock between head and concaves. The head and shaft of the type "S" crusher is suspended on springs to permit tramp steel to pass through. The ball-and-socket eccentric is self-aligning. This crusher may be operated by a synchronous motor, built in the pulley of the crusher, or by belt from standard motor. This crusher takes one-half the power required for a geared crusher, and saves 80% in the cost of maintenance.

We manufacture a complete line of primary jaw and gyratory crushers, ball mills, rod mills, screening, elevating, and conveying equipment, etc. Complete information describing any or all of this machinery will be sent on request. *Send for latest information on our vibrating screen.*

KENNEDY-VAN SAUN MFG. and ENG. CORP.

Two Park Avenue **New York, N. Y.**

BRANCH OFFICES:—Chicago: 120 South La Salle St. Birmingham, Ala.: Comer Building. Los Angeles, Calif.: 414 South Spring St. London, England: Bush House. Paris, France: 40 Rue des Mathurins. Johannesburg, S. Africa: 73 Cullinan Bldg. Canadian Agents, Canadian Fairbanks-Morse Co., 980 St. Antoine St., Montreal, Que. Walkers Limited, Maryborough, Queensland, Australia. Cuban Agents, Gerard Jansen Y Cia, Compostela 43, Havana, Cuba.

TZ REDUCTION CRUSHER
WITH PATENTED BELL HEAD AND CURVED CONCAVES

Absolutely Non-Choking, therefore ALL power used for crushing.

Do these results interest you?—

80 tons per hour to 7/16″ from 4″ feed with 70 HP

325 tons per hour to 1⅛″ from 6″ feed with 175 HP

What Do You Want To Do?

A TZ Will Do It Right!

Write Us Now!

In connection with certain types of non-choking crushers, we call the attention of the public to our patent 1,837,102 issued December 15, 1931, relating to crushers of this type. We intend to enforce our rights under said patent against all manufacturers and users of stone crushers containing the features covered by said patent and to prosecute all infringers of said patent.

TRAYLOR ENGINEERING & MANUFACTURING CO.

ALLENTOWN, PENNSYLVANIA

NEW YORK 2513 Empire State Bldg. CHICAGO 2131 One LaSalle St. Bldg. LOS ANGELES 908 Chester Williams Bldg.
SALT LAKE CITY 101 W. 2nd South St. SEATTLE 815 Alaska Bldg.
TIMMINS, ONTARIO, CANADA, Moore Block
Export Department, 104 Pearl St., New York City—Cable Address: "Forsaltra"

Buy "A Haiss"

BECAUSE it is the most successful, most satisfactory and most profitable — which facts you can confirm from users, and reason out from reading the Haiss catalogs. 4 Standard Haiss Loaders—1 to 3 yds. per min.

Ask for catalogs.

George Haiss Manufacturing Co., Inc.
142d St. & Rider Ave., New York, N. Y.
Builders also of HAISS ELEVATORS—SCREENS—CLAMSHELL BUCKETS

DEPENDABLE EQUIPMENT

BUILT FOR LONG, HARD SERVICE WITH LOW MAINTENANCE COST

We offer RELIANCE Crushing, Screening and Washing equipment in capacities from 50 to 1500 tons per day. Simplicity of design with low operating cost and clean separation.

CATALOGUE AND FULL INFORMATION ON REQUEST

UNIVERSAL ROAD MACHINERY CO.
KINGSTON, N. Y.
SALES OFFICES THROUGHOUT THE WORLD

for

an effective presentation of your equipment and production methods

before

interested technical and industrial bodies in the Soviet Union

Prepare your

Catalogs
Instruction Booklets and
Other descriptive technical literature

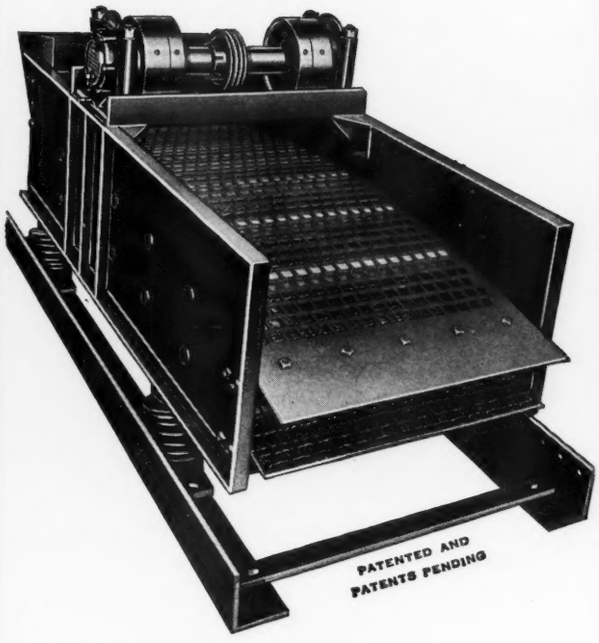
in the Russian language

Ask for our Bulletin No. 2

AMTORG PUBLISHING DIVISION

261—5th AVE. NEW YORK, N. Y.

252
Tons Per Hour



One Double Deck 4′ x 8′
PLAT-O
Vibrating Screen

Screened 2460 tons in 9 hrs. 45 min. continuous operation in plant of Miami Gravel Company, Richmondale, Ohio, producing three finished products of sand and gravel.

This is the third season's operation for this particular machine.

Write for Bulletin No. 21

See P & Q Handbook Page 242.

DEISTER MACHINE CO.
1933-2003 E. Wayne St.
Ft. Wayne, Ind.

THE BRADLEY
AIR CLASSIFIER

and the

BRADLEY HERCULES MILL

Operating in conjunction with the Tube Mill make possible either open circuit or closed circuit, or a combination of the two on the primary and secondary reduction stages.

Operated in Closed Circuit with the Tube Mill, the Bradley Air Classifier Insures

Maximum Capacity
Absolute Uniformity of Product
Any Degree of Fineness
Within the Range of Commercial Operation

Recent improvements to the BRADLEY AIR CLASSIFIER have materially increased its efficiency and emphasize its leadership in the field of Air Separation

—WRITE FOR CATALOGS—

Our engineers are at your service

BRADLEY PULVERIZER CO.

Boston Works: ALLENTOWN, PA. London
Etablissements Fernand Poitte, Paris

Perforated Metals—Screens of All Kinds—For Sand, Gravel, Stone, Etc.

MATERIAL IN STOCK
PROMPT SHIPMENT

CHICAGO PERFORATING CO.
2435 West 24th Place
Tel. Canal 1459 CHICAGO, ILL.

Lewistown Foundry Products
ARE
Performance-Tested

BUCKET ELEVATORS
REVOLVING SCREENS
CRUSHERS DRY PANS

Lewistown Foundry & Machine Co.
Lewistown, Pa.

"Only $3 for all this?"

You'll be surprised, too, when you see how much luxury and convenience you can enjoy at the Hotel Lexington for as little as $3 a day.

And here's another fact that'll make your expense account beam with gratitude—it costs only $1 a day more for two persons at the Lexington. A room which is $3 for one, for instance, is only $4 for two persons.

HOTEL LEXINGTON
In Grand Central Zone, Lexington Ave. at 48th Street
NEW YORK CITY
CHARLES E. ROCHESTER, *General Manager*

WE SPECIALIZE IN ALL KINDS OF SCRUBBING PROBLEMS IN

The ALLSWEDE SCRUBBER positively removes mud and clay balls from stone and gravel and materially reduces soft stone content.

CRUSHED STONE or GRAVEL

The GREENVILLE SOFT STONE ELIMINATOR removes shale, sandstone and deleterious substances which resist ordinary scrubbing action.

All machines designed to meet specific conditions by the

F. M. WELCH ENGINEERING SERVICE, Inc., GREENVILLE, OHIO

Perforated Metals ++

FOR LONG WEAR AND FAST PRODUCTION

Use CROSS PERFORATED screen SECTIONS and PLATES for Revolving, Vibrating and Shaking Equipment

The standard of quality for over thirty years

We are equipped to furnish promptly
Rounds, squares, slots or any design perforation
Punched from Special or Ordinary Steels

Buckets, Conveyor Trough, Chain, Replacement Parts, Rubbish Burners, Fabricated Steel Plate Work

Send your specifications for our low prices

Perforators Fabricators Machinists

CROSS ENGINEERING COMPANY
Carbondale, Pa.

CUSTOMER FACTS vs.
SALESMAN FICTION

THE Leahy HEAVY DUTY *Vibrating Screen*

Why buy on a salesman's say so when eleven years of background and the Customer Facts from two thousand installations suggest the LEAHY.

THE DEISTER CONCENTRATOR CO.
911 Glasgow Ave. Incorporated 1906 Ft. Wayne, Ind.
Export Sales: 104 Pearl St., New York City

ALLEN
Cones and Tanks
For Wet Grading of Sands

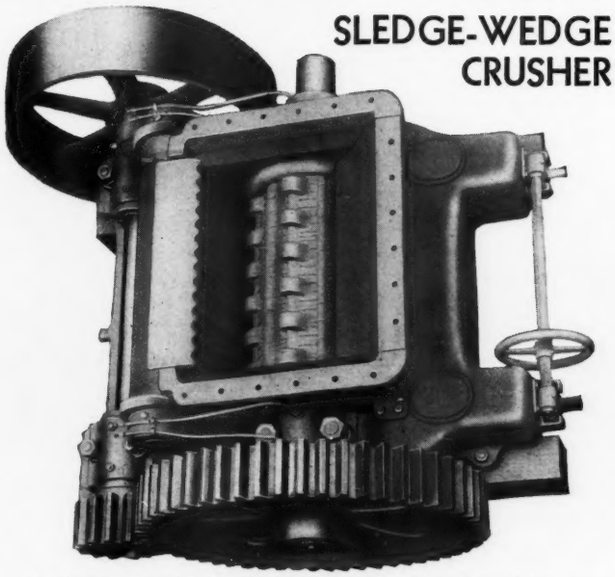
Will economically produce clean, accurately graded sands, and enable you to meet sand requirements of the most rigid specifications.

Write for details.

Allen Cone and Machinery Corporation
30 Church St. ENGINEERS New York, N. Y.

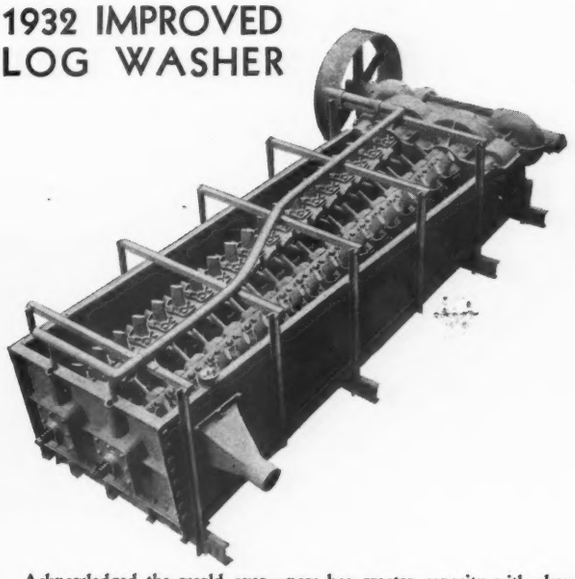
McLanahan Products Are Years Ahead

SLEDGE-WEDGE CRUSHER



Combining the swing hammer with the squeezing action of jaw, cone, and gyratory crushers, and to this added the splitting action of driving wedges. Per ton capacity, this crusher is the lowest priced, takes smaller power, fewer repairs, and requires less head room than any other on the market. Further details gladly furnished.

1932 IMPROVED LOG WASHER



Acknowledged the world over—now has greater capacity with absolutely clean products, lower power consumption, lower operating costs, and is much more durable than previous models—truly a machine built for competitive work. Send for further details.

McLANAHAN & STONE CORPORATION

Manufacturers » Founders » Machinists » » » » » » » Continuously in Business Since 1835

HOLLIDAYSBURG, PENNSYLVANIA

Factory
Kingston,
N. Y.

FOR MATERIALS REQUIRING FINE SEPARATION

THE NEW MODEL "28" GAYCO, with its improved mechanical construction, offers **greater capacity, cleaner tailings, more uniform product,** and **higher efficiency** than is possible with any other air separator. **Quick, positive adjustment** for any mesh. **Automatic** lubrication. **Steep angle cones** preventing material building up and choking. **No dampers, no choke deflectors.**

Send Sample Material for Free Test

Catalogue on Request

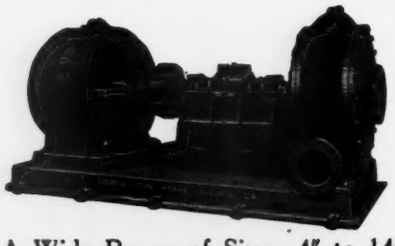
RUBERT M. GAY, 114 Liberty St., New York
DIVISION OF UNIVERSAL ROAD MACHINERY CO., KINGSTON, N. Y.
Manufacturers of "RELIANCE" Crushing, Screening and Washing Equipment

NATIONAL SPRING WIRE CLOTH

Manufacturers
Genuine Spring Steel Wire Cloth
in Double and Lock Meshes
IMMEDIATE SHIPMENT FROM STOCK
Write for Catalogue
National Wire Cloth Company
Foot of Belle Street **St. Paul, Minn.**

"Anchor"
"Anchor" Rerailers
Will retrack wheels from either or both sides of track at once
ANCHOR
"Anchor" Puller-jack
The One-Man outfit for pulling, moving, lifting heavy loads
SAVES TIME & LABOR
NEW LOW PRICES
Complete Bulletin sent on request
"Anchor" Track Braces
For quick, lasting track repairs
THEY PAY FOR THEMSELVES
T. H. Edelblute Co.
Reynoldsville, Pa.
U. S. A.

SAND AND DREDGING PUMPS

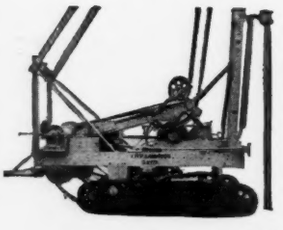


A Wide Range of Sizes, 4" to 14"

Send for illustrated booklet

GEORGIA IRON WORKS, AUGUSTA, GA.

Can Drilling Costs be Lowered?



The New Loomis "Clipper" size 44 answers the question with friction clutch operated full length crawlers—simple, durable, accessible. It will climb unusually steep grades and will pay for itself in time saving (which can be devoted to drilling) getting to the jobs that are hard to reach and quick shifting to positions.

Size 44 "Clipper" comes equipped with steel frame, wooden or steel mast, wire or manila line.

Write for full information.

Established 1842

THE LOOMIS MACHINE CO. 15 E. Market Street TIFFIN, OHIO

COLD MIX ASPHALT PLANTS
SIMPLICITY DEPENDABLE
THE SIMPLICITY SYSTEM COMPANY
CHATTANOOGA, TENNESSEE
FOR QUARRIES

On 5th Avenue....

Near Smithfield—one of the most conveniently situated hotels in town—with easy access to all the main points of interest

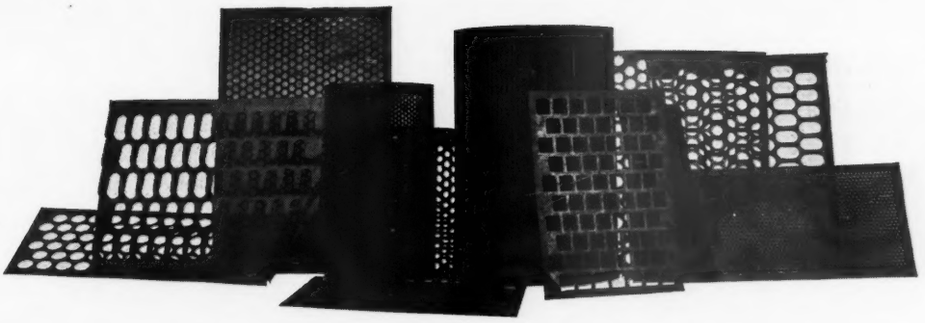
RATES: Single $2.00 and up; Double $3.00 and up

EXCELLENT RESTAURANT

Breakfast, 40c to 75c Luncheon, 75c Table d'Hote Dinner, $1.25

POPULAR PRICED COFFEE SHOP

HOTEL HENRY
PITTSBURGH



For Best Results Use the Morrow!

THE Morrow Perforated Metal Screens for sizing and preparing coal, sand, gravel, stone, and other bulk materials are made by a company specializing in screening machinery.

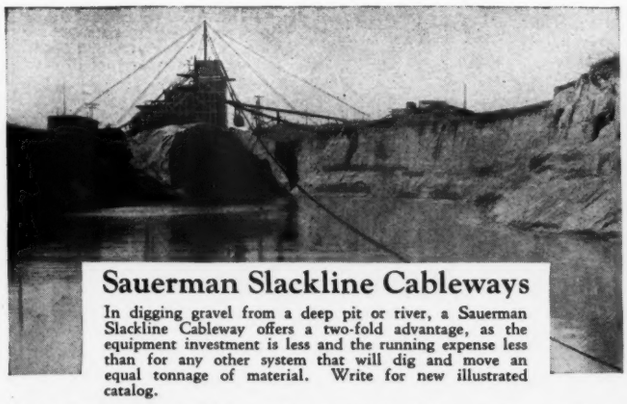
Behind our recommendations to you lies years of experience which has taught us the best line of screens to use for a given work.

You are offered such sizes and shapes of perforations which we know to be best suited to the screening of bulk materials.

If our wide stock does not suit your particular purpose, we will make special plates to your specifications. Our factory is equipped to roll or flange plates to order, and will punch marginal holes as directed.

Write for full particulars.

THE MORROW MFG. CO. QUALITY MORROW SERVICE **WELLSTON - OHIO**



Sauerman Slackline Cableways

In digging gravel from a deep pit or river, a Sauerman Slackline Cableway offers a two-fold advantage, as the equipment investment is less and the running expense less than for any other system that will dig and move an equal tonnage of material. Write for new illustrated catalog.

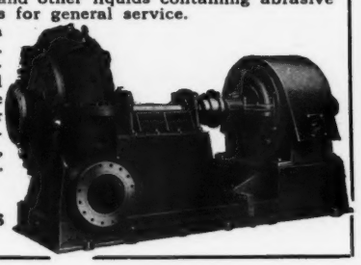
SAUERMAN BROS., INC., 434 S. Clinton St., Chicago

MORRIS

CENTRIFUGAL PUMPS

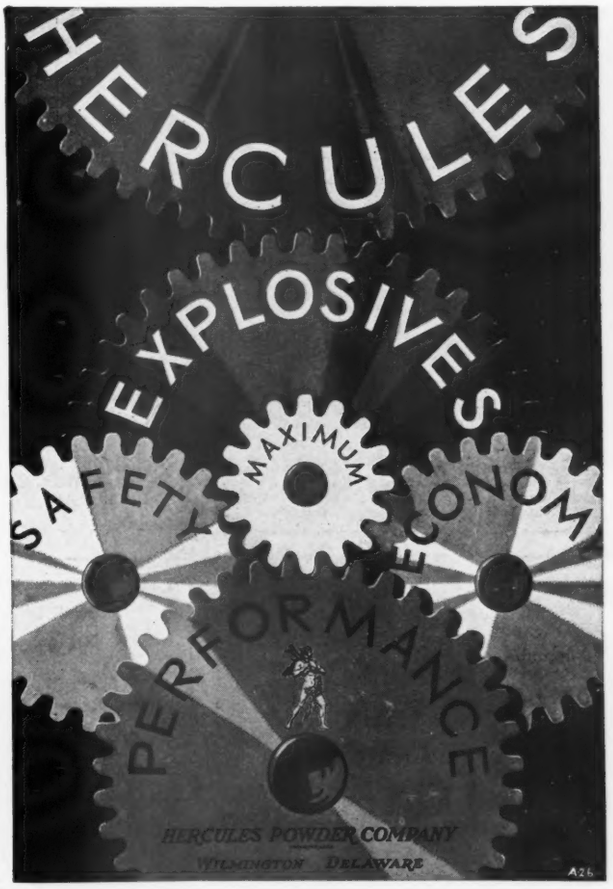
For hydraulic dredging, filling, sand and gravel production, hydraulic conveying of slurry and other liquids containing abrasive materials, clear water pumps for general service.

Also complete dredges with all accessory equipment. Dredging pump designs include heavy duty types and special alloy parts for severe service. Types and sizes for the largest or smallest operations, and belt, motor, steam, oil or gasoline-engine drive.



Write for Bulletins

Morris Machine Works
Baldwinsville, N. Y.



CRUSHERS (JAW)

Farrel ..... 6 x 20
Sturtevant ..... 6 x 15
Farrel ..... 18 x 36
Farrel ..... 42 x 48
Champion ..... 10 x 30

CRUSHERS (ROLL)

Traylor, 16" x 42" dia.
Allis Chalmers, 24" x 60" dia.

COMPRESSORS

2—Chicago Pneumatic and Ingersoll Rand, 12" x 10", cap. 360 ft., short belt idler, A.C. motors, etc.
1—Worthington 13 x 14, cap. 522 ft., short belt idler.

HAMMER MILLS

1—Penna. all steel SXR6.
1—Williams No. 2 and No. 3.

PULVERIZERS

1—Raymond No. 00 with air separator, collecter, etc.
1—Hardinge Mill 8" x 48".
1—Stroud Class 2-A, with all auxiliary equipment.

SCREEN

Telsmith 48" x 18' scrubbing and sizing Screen, with or without plate feeder and motors.

AIR HOIST

1—Sullivan class HDA7 for slushing, scraping, hoisting.

CARS

30—4 yd. Kopple V-shape all steel rocker dump, 36" gauge.

HOIST

1—Single drum Mine Hoist 78" dia., 72" face, 350 H.P. A.C. motor and auxiliary equipment.

DERRICK AND HOIST

1—Steel Stiff Leg 30 ton, 75' boom, with or without 8½ x 10, 3 drum engine and boiler.

DRAG SCRAPER AND SLACKLINE

1—Sauerman 180 H.P. direct connected A.C. Motor, 2 Speed, Slackline Hoist with 100' mast, 2½ yd. bucket, cables and all fixtures.
1—Sauerman 75 H.P. and 1—50 H.P. direct connected to A.C. motors for 1 yd. and 2 yd. drag scraper work.
1—Sauerman 10 x 12 steam, 2 speed Hoist.

A. J. O'NEILL CO.

1524 Chestnut Street **PHILADELPHIA, PA.**

CONSOLIDATED offers GOOD USED CRUSHING, PULVERIZING, DRYING AND FILTERING EQUIPMENT—COMPLETE

Crushing Plants; Diesel, Gasoline, Electric Cranes and Shovels; Hoists; Compressors; Pumps; Dragline and Excavating Equipment; and all sizes and types of Jaw, Gyratory and Roll Crushers; Swing Hammer Mills; Elevators; Belt Conveyors; Rotary and Vibrating Screens; Rotary Kilns and Dryers; Raymond and other fine Pulverizers; Air Separators; Hardinge Ball and Pebble Mills; Silex and iron lined Tube Mills, etc. Send for Bulletin No. 14.

CONSOLIDATED PRODUCTS CO., Inc., 17-19 Park Row, New York City
Tel. Barclay 7-0600 Shops and Yards at Newark, N. J., now cover eight acres

---

FOR SALE

NEW 84" x 60' Jaw Crusher

With 2—No. 12 Gyratory Crushers (New)
Screens—5 to 300HP—60 Cy. 3 Ph. Motors (New) etc.
Box 104, Pit and Quarry, 538 S. Clark St., Chicago, Ill.

LOCOMOTIVES

All Equipped with Asme Boilers

70-ton 19x24" Porter 6-wheel saddle tank, 200-lbs. steam.
60-ton 18x24" Porter 6-wheel saddle tank, 200-lbs. steam.
50-ton 16x24" American 4-wheel saddle tank, 180-lbs. steam.
40-ton 14x22" American 4-wheel saddle tank, 190-lbs. steam. (2 Duplicates.)
38-ton 14x20" Porter 4-wheel saddle tank, 180-lbs. steam.
28-ton 12x18" Vulcan 4-wheel saddle tank, 190-lbs. steam.
21-ton 11x16" American 4-wheel saddle tank, 180-lbs. steam.
21-ton 11x16" Vulcan 4-wheel saddle tank, 190-lbs. steam, 36" gauge.
70-ton 20x26" Baldwin 6-wheel Switcher with separate tender, 180-lbs. steam.

Our stock also includes many other locomotives, locomotive cranes, shovels, cars, etc. Complete list on request.

Birmingham Rail & Locomotive Company
BOX 391, BIRMINGHAM, ALA.

CRUSHERS

Symons Cones, 7 ft., 5½ ft., 4 ft. and 3 ft.
Allis-Chalmers Gyratory 21-K, 15-N and 12-K.
Allis-Chalmers 48x36 Jaw Crusher.
Traylor 42x48, 48x60 and 24x36.
Telsmith Reduction No. 40 and No. 2.
Traylor 36x16 Crushing Roll.
Buchanan Jaw, 36x54".
Universal Jaw, 15x36".
Kennedy Gearless Reduction No. 37.
Allis-Chalmers, Blake Type 12x24 Jaw.
Farrel and Carroll 24x36 Jaw.
Jeffrey Single Roll 36x54 and 24x24.
Allis-Chalmers 8-K, 7½-K, 5-K, 4-K and No. 3.
Austin No. 10, No. 5, No. 4 and No. 3.
Symons Disc 48 in., 36 in., 24 in., 18 in.
Allis-Chalmers, Rolls 42"x16" and 36x16.
Williams No. 6 Jumbo Jr. with Feeder.
Portable Jaw, 16x24, Bucket Elevator, 20 ft.
Perfect Classifier Gravel Washer.
OTHER CRUSHERS AND QUARRY EQUIPMENT —CONVEYORS, BUCKET ELEVATORS, SCREENS, ETC. VARIOUS TYPES AND SIZES.

QUARRY AND PLANT EQUIPMENT

Bucyrus 50-B Diesel Drag, 60' boom. Like new.
Universal Truck Crane with Christie Crawlers
Lorain 55 Comb. Shovel & Crane, 1 yd.
General ½ yd. Crane. Like new.
Page Diesel Dragline Crawler 2 yd. 70' boom.
Bucyrus 50-B Diesel Shovel and Drag. High Lift.
Northwest Gas Shovel, 1½-yd. Late Type.
Buda, 155-hp. Gas Motor, 6-cyl.
Gas Locomotives, 10-ton, 14-ton and 20-ton, std. ga.
OTHER MAKES, TYPES AND SIZES ON HAND. COMPRESSORS, CARS, LOCOMOTIVES, BUCKETS, BOILERS & POWER EQUIPMENT.

F. MAYER 53 W. Jackson Blvd., Chicago, Ill.

WE BUY—SELL—REPAIR

All Types of Electrical Machinery. Each One Rebuilt and Fully Guaranteed

ELECTRIC GENERATOR AND MOTOR CO.
Cor. E. 53rd. St. & Hamilton Ave., Cleveland, Ohio

Gregory

HI-GRADE-REBUILT

Motors, Generators, Transformers, Meters, Exhaust Fans, Blowers, Pumps, etc. All standard makes and sizes. Rock bottom prices. Money-back guarantee. Send for bargain sheet.

GREGORY ELECTRIC CO.
Lincoln & 16th Sts., CHICAGO

DERRICK OUTFIT

1—5-ton Steel Stiff Leg Derrick, 80-ft. boom, 150 HP American 3-Drum Hoist, with or without 2½ yd. Clam Shell.

LOCOMOTIVES

5—40-ton American and Baldwin 4-Driver Saddle Tank Locos., built 1926 and 1929.
1—20-ton and 3 8-ton Vulcan std. ga. Gas Locos.

CARS

12-yd. Western Air, also Hand Dump Cars, Flats, Gondolas, Steel Hopper Cars, Box Cars.

HYMAN-MICHAELS COMPANY

20 N. Wacker Dr. Bldg., Chicago, Ill.
Railway Exch. Bldg. St. Louis, Mo.
101 West 31st St. New York

GASOLINE POWER UNITS

Waukesha 45 to 90 HP. With or without clutch, radiator, starter. Suitable to crusher operation or shovel replacement.

10x15, 10x30, 13x30, 24x36. Jaw type crushers.

Lorain 75, P&H 600 and Erie B2 shovels.

L. B. SMITH, INC.
Camp Hill, Pa.

MOTOR BARGAINS

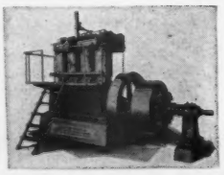
3 PHASE, 60 CYCLE

HP	Make	Volts	Type	Speed
1-800	G. E.	2300	Slip Ring	720
1-600	G. E.	440	Synch.	360
1-300	Al. Ch.	2200	Slip Ring	585
1-275	G. E.	550	Synch.	900
2-200	G. E.	2200/440	Synch.	514
1-200	Wathse.	440	Slip Ring	500
1-200	F. M.	440	Slip Ring	600
1-200	Wathse.	220/440	Sq. Cage	585
1-150	G. E.	550	Synch.	720
1-104	G. E.	220/440	Slip Ring	870
1-100	Wathse.	220/440	Slip Ring	575

Motors—Generators—Transformers and Other Electrical Equipment

Belyea Co., Inc. 153 W. 18th St. New York City

REBUILT—GUARANTEED



MERIAM REBUILT GAS ENGINES

Mr. Meriam is the original designer of the Bruce-Macbeth line of gas engines. We now have our own shops and test floor. We thoroughly rebuild Bruce-Macbeth and other gas and oil engines. The guarantees are the same as when new. Price low. We do not ask you to pay in full on shipment. Let us refer you to some of the installations. Write to

The Meriam Company 1956 West 112th St. Cleveland, Ohio

Quarry and Contractors Equipment at

BARGAIN PRICES

Revolving Screens, Stiff-Leg Derricks; Hoisting Engines; Insley Mast, hoppers, and chutes; Ransome three-bag Mixer; Keystone Well Drill.

For full information, communicate with:—

NEW YORK TRAP ROCK CORPORATION
230 Park Avenue, NEW YORK CITY

For Sale

1—No. 7½ McCully Crusher.
1—No. 6 Smith Crusher.
1—No. 5 Austin Crusher.
1—10" Superior McCully Crusher.
1—8" Traylor Crusher.
2—No. 3 Gates Crushers.
1—6" Superior McCully Reduction Crusher.
1—48" Symons Horizontal Disc Crusher.
Several Jaw Crushers.
Gas and Electric Motors, 1 HP to 200 HP.
1—Clipper Well Drill.
1—Clyde 2 Drum Hoist, built for 2 Yd. Drag Scraper, with or without motor.
2—Complete Gravel Washing Plants.

LIPPMANN ENGINEERING WORKS
4603 W. Mitchell St. Milwaukee, Wis.

"E. C. A." Equipment For Immediate Delivery

Large selection on display in our THREE warehouses.

AIR COMPRESSORS—Portable and stationary, belt driven, with electric or gasoline power in sizes from 21 cu. ft. to 1000 cu. ft.

BOILERS—Vertical, locomotive type, from 10 HP to 500 HP.

BUCKETS—Clamshell, dragline, dragscraper and cableway, excavator, in all sizes.

CARS—24 in., 36 in. and standard gauge, dump and flat cars, all types.

CONVEYORS AND ELEVATORS—16 in., 18 in., 24 in. and 36 in. belt conveyors, portable and stationary. Bucket elevators of all sizes and heights, enclosed or open type.

CRANES—1—No. 1 Brownhoist ½-yd. 2—No. 2 Brownhoist 1-yd. 1—K-1 Link Belt 1-yd. 1—Austin Wolverine 1-yd. 1—Erie type B-2. 3—Locomotive cranes. 1—Browning 25-ton. 2—Ohio 25 & 30 ton.

CRUSHERS—Jaw, gyratory, cone and roll; all sizes.

DERRICKS—Steel and wood stiff leg or guy, from 5 to 50-tons.

DRAGLINES—Steam, gas and Diesel, all makes and sizes.

HOISTS—Gasoline, Electric and Steam; all sizes.

LOCOMOTIVES—24 in., 36 in. and standard gauge, gas or steam, all sizes.

PNEUMATIC TOOLS—Drills, jackhammers and concrete breakers, all makes and sizes.

PUMPS—All sizes and types, both force, centrifugal and steam.

SEND FOR COMPLETE STOCK LIST

EQUIPMENT CORPORATION OF AMERICA

PHILADELPHIA—Suite 1160 Broad St. Station Bldg. Phone Rittenhouse 6100

CHICAGO—1160 S. Washtenaw Ave. Phone Nevada 2400

PITTSBURGH—860 Empire Bldg. Phone Grant 6100

MARTIN'S REBUILT MACHINERY BARGAINS

Jaw Crushers — Trommell Screens — Jackhammer Drills
Crushing Rolls — Air Compressors — Asphalt Rock Crushing Plants
50 Ingersoll, Sullivan & Chicago Pneumatic Piston Drills
50—Steam Pumps—all sizes worth the money. Send your inquiries to Martin's—they will save you money

WRITE, WIRE OR PHONE

E. A. MARTIN MACHINERY CO., Joplin, Mo., Phone LD-40

Bucyrus Erie Electric Dragline

Class 225-B, mounted on 4 propelling trucks on track; boom 143' long; 1 Page Bucket 6 cu. yds. capacity. Electric equipment includes—440 volt, 3 phase, 60 cycle motors and controllers; size of main motors 2—200 HP each Westinghouse; swing motor 150 HP Westinghouse (all 3 type C. I. synchronous speed motors); 3—150 KVA Westinghouse 2200 volt transformers stepping down from 2200 volts to 440 volts. Complete electric light equipment. Type of hoist and dragline friction, outside bands set up by air thrust cylinder; type of boom suspension; drum geared to main motors. Boom equipped with safety cables. Diameter of hoist rope 1"; drag rope 1¾"; boom hoist rope ⅞". Turntable 30' diameter, revolves on steel rollers between two 90 lb. rail circles. House built of wood panels; roof of sheet steel; weight of machine 317 tons. Condition excellent; can be demonstrated at Eaton Park, Florida.

SOUTHERN PHOSPHATE CORPORATION
1812 Baltimore Trust Bldg., Baltimore, Md.

TRUCK MIXERS

For sale at a bargain in the following sizes:
3—3½ yard
4—2 yard
1—1 yard
Have been used in one job only—Rebuilt like new.

HIGHWAY TRUCK MIXER COMPANY
Columbus, Ohio

—CRUSHING PLANTS—

24x36 Farrel B Electric Drive, 18x14 Farrel, Screens, Elevators, Conveyors—Used 2 years.
15x30 Reliance, 125 HP Gasoline Drive, Elevator, Screen, Bin. New 1931.

R. C. Stanhope, 875 Sixth Ave., New York, N. Y.

FOR SALE

Osgood 1-yard gas crawler shovel, overhauled.
Locomotives: 75-ton switcher code boiler; also saddle tank type, narrow and standard gauge.
CARS: side dump 12-yard; 50-ton steel twin hopper cars, etc.
Large stock Railroad and Contractors equipment.

SOUTHERN IRON & EQUIPMENT CO.
Atlanta, Ga.

FOR SALE

O and S 22-ton Locomotive Crane, 50 ft. boom, 1½ yd. clam shell bucket. In good working condition for $800.00, cash, like it is. A bargain for some one, where it stands, at this low price.

LEONARD GRAVEL CO.
302 Hollister Bldg. Lansing, Mich.

ELECTRICAL MACHINERY

Motors and Generators, A.C. and D.C. for sale at attractive prices. New and Rebuilt. All fully guaranteed. Write for List and Prices.

V. M. NUSSBAUM & CO.
FORT WAYNE, IND.

WANTED

Complete plant equipment suitable for manufacturing granules, from 10 to 30 mesh. Address Box 912, Pit and Quarry Publications, 538 S. Clark St., Chicago

REBUILT BUCKETS

1—Haiss 1-yd. "Hi-Power" type Bucket.
1—Haiss 1-yd. "Contractor" Bucket.
1—Haiss ¾-yd. "Contractor" Bucket.
1—Haiss ¾-yd. "Hi-Power" Bucket.

REBUILT TRUCK LOADERS

1—Haiss Path Digger with Waukesha Engine.

GEORGE HAISS MFG. CO., INC.
140th St. & Rider Ave., New York City

WANTED

One used Direct Heat Rotary Dryer, Complete. Capacity 15 tons per hour. Moisture content 6% to 10%. Give location, condition, price and full particulars. Address Box 1102, Pit and Quarry Publications, 538 S. Clark St., Chicago.

Shovels or Cranes

FOR SALE

1—Factory rebuilt Lima 1¼ cu.yd. capacity. This machine can be equipped with either shovel, clamshell, dragline or drag shovel attachments. Very reasonably priced. Carries new machine guarantee. Located at Newark, N. J.

1—P & H 1¼ yd. shovel front end, complete with dipper and cable. Very good condition, at a bargain. Located Newark, N. J.

1—Heavy duty Osgood Steamer, combination shovel and crane. This machine is in A-1 working condition. A real bargain. Located Toledo, Ohio.

1—Koehring ¾ yd. Shovel. Excellent condition throughout. Located Newark, N. J.

1—Erie B Steam Shovel. In excellent condition. Also number of spare parts. Unusual bargain price. Located Brooklyn, N. Y.

1—Northwest ¾ yd. Crane. Very good condition, at low price. Located Brooklyn, N. Y.

1—Complete shovel attachment for Type "O" Thew. Decided bargain.

LIMA EXCAVATOR SALES AGENCY

Lima, O., Office:
Lima Trust Bldg.
Tel. Main 4824

Eastern Offices and Warehouse:
317 Frelinghuysen Ave., Newark, N. J.
Tel. Waverly 2-0640

Wire or phone nearest office at our expense.

For Only a

One Dollar Bill

You Get 12 Big Issues of Pit and Quarry with

1. All the News of the Industry
2. The Best Editorial Features Available

PAY NO MORE—Send that Dollar Now!

WANTED

To buy used set two volumes "Sands and Crushed Rocks" by Alfred B. Searle, printed in 1924. Volume I, "Their Nature, Properties, and Treatment." Volume II, "Their Uses in Industry." Address F. M. Thorman, Box 151, Oakfield, N. Y.

WANTED

Cheap ¾ Yd. Gasoline Shovel
Address Box 1014, Pit and Quarry Publications, 538 S. Clark St., Chicago.

RYERSON

Immediate steel for maintenance and repair. You can depend upon Ryerson for quick action. Complete stocks of all steel products including bars, plates, sheets, structurals, bolts, nuts, rivets, boiler fittings, chain, etc. Order from the nearest plant. Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

STEEL

CORE BORINGS
DIAMOND DRILLING
Sprague & Henwood, Inc.
225 W. Olive St. Scranton, Pa.

SWEDISH HOLLOW DRILL STEEL
GUARANTEED 100% PERFECT
Considerably below market prices.
20 ton ⅞ in. Hexagon.
50 ton ⅞-in., 1-in., 1⅛-in., 1¼-in., and 1⅜-in. Round, Hexagon and Quarter Octagon.
MARINE METAL & SUPPLY CO.
167 South St. New York City

Prices Warrant Buying Now
Cars 12 yd. Koppel Steel hand dump.
Conveyor 40 ft. elevating electric.
Cars RR—Office & Tool—Pile Driver—Camp.
Mast and boom fir—12x18x85′—16x16x80′.
Cranes Link Belt 4 type K55—2 type K2.
Draglines 2 Cl. 14—1 Monighan—1 Orton.
Compressors Ing. 880 ft. steam—Wort. uniflow 356′.
Screw conveyors four 6″—two 12″ enclosed.
A. V. KONSBERG, 111 W. Jackson Blvd., Chicago

For Sale at Bargain Prices
New 18″ and 24″ antifriction belt conveyor idlers.
Elevator buckets of all sizes. Complete conveyors and bucket elevators.
EXCELSIOR MACHINE CO.
2601 Kutztown Road
(Hyde Park) Reading, Pa.

Patents Secured to Protect Inventions
Royal E. Burnham
Patent Attorney
Continental Trust Bldg.
Washington, D. C.
TRADE MARKS

CLAPP, RILEY & HALL EQ. CO.
Guaranteed Equipment—
For Sale or Rent
No. 16 N. Clinton St. - - CHICAGO
Union Trust Bldg. - PITTSBURGH

FOR SALE OR TRADE
on ½ or ¾ gas or steam shovel on cats.
1—2 drum drag scraper hoist, 50 H.P. Elec.
WRITE
The Brookville Gravel Co.
Brookville, Ohio

AMERICAN CRANE
Model 685 American Steam Revolver, wheel mounted, 85 ft. boom, 15 ft. center extension. Capacity 6 tons @ 80 ft., 25 tons @ 25 ft. Like new.
GEORGE W. WALLSTROM
8 So. Adolph St. AKRON, OHIO
Phone: JEfferson 2161

FOR SALE
1⅛ Yard light Omaha dragline bucket complete with hoist, drag bails and set of four teeth.
NORTHWESTERN GRAVEL COMPANY
Lake View, Iowa

WE LOOK INTO THE EARTH
By using Diamond Core Drills. We drill for Limestone, Gypsum, Talc, Fire Clay, Coal and all other minerals.
PENNSYLVANIA DRILLING CO.
Drilling Contractors
Pittsburgh, Pa.

FOR SALE
1—60 ft. NORTHERN KING Conveyor, 24″ belt, equipped with 24 H.P. motor.
1—No. 5-C TELSMITH Crusher with extra parts.
1—1½ yd. Heavy Duty OWEN Clamshell Bucket.
THE W. T. WALSH EQUIPMENT CO.
12500 Berea Road, Cleveland, Ohio

WANTED
Second hand 350 H. P. Diesel Engine with A. C. Generator, three phase, 60 cycle, 440 volts together with panel board. Must be modern and in A-1 condition. Address Box 1100, Pit and Quarry Publications, 538 S. Clark St., Chicago, Illinois.

PIT AND QUARRY
Research Department
538 South Clark St., Chicago, Ill.

Please send me catalogs and prices concerning the following items checked below:

- ☐Agitators, sand and Gravel
- ☐Agitators, Slurry
- ☐Air cleaners
- ☐Air compressors
- ☐Bag filling and weighing machinery
- ☐Bags, cloth
- ☐Bags, paper
- ☐Balls, steel
- ☐Barges, steel
- ☐Belt dressing
- ☐Belt fasteners
- ☐Belting, conveyor and elevator
- ☐Belting, transmission
- ☐Belt lacing
- ☐Belt plates
- ☐Belt rivets
- ☐Belt tighteners
- ☐Bin gates
- ☐Bins, concrete
- ☐Bins, steel
- ☐Blasting supplies
- ☐Blasting powder
- ☐Blocks, friction
- ☐Boats, self-unloading
- ☐Bodies, Motor Trucks
- ☐Brake Linings
- ☐Buckets, Clamshell
- ☐Buckets, Conveyor and Elevator
- ☐Buckets, Dragline
- ☐Buckets, Orange Peel
- ☐Cableways, Slackline
- ☐Calcining Machinery
- ☐Car Dumpers
- ☐Car Pullers and Movers
- ☐Carriers, Belt
- ☐Cars, Dump
- ☐Cars, Kiln
- ☐Castings, Manganese Steel
- ☐Castings, Steel
- ☐Chains, Conveyor and Elevator
- ☐Chains, Power Shovel, Crane and Dredge
- ☐Chains, Transmission
- ☐Chutes
- ☐Classifiers
- ☐Clips, Wire Rope
- ☐Clutches
- ☐Clutches, Magnetic
- ☐Concrete Plants, Ready Mixed
- ☐Cones, Washing
- ☐Conveyors, Apron
- ☐Conveyors, Belt
- ☐Conveyors, Pneumatic
- ☐Conveyors, Screw
- ☐Conveyors, Skip
- ☐Coolers
- ☐Couplings, Flexible
- ☐Couplings, Hose
- ☐Cranes, Locomotive
- ☐Cranes, Overhead Traveling
- ☐Cranes, Truck
- ☐Crushers, Cone
- ☐Crushers, Disc
- ☐Crushers, Gyratory
- ☐Crushers, Hammer
- ☐Crushers, Jaw
- ☐Crushers, Ring
- ☐Crushers, Roll
- ☐Crushers, Rotary
- ☐Cutter Heads, Dredging
- ☐Derricks
- ☐Draglines, Cableway
- ☐Draglines, Revolving Boom
- ☐Dredges, Dipper
- ☐Dredges, Hydraulic
- ☐Dredges, Ladder
- ☐Drill Sharpening Machinery
- ☐Drills, blast hole
- ☐Drills, Diamond Core
- ☐Drills, Hand Hammer
- ☐Dryers, Rotary
- ☐Dryers, Sand and Gravel
- ☐Dust Collecting Systems
- ☐Dynamite
- ☐Elevators, Bucket
- ☐Engines, Diesel
- ☐Engines, Gas
- ☐Engines, Gasoline
- ☐Engines, Hoisting
- ☐Engines, Oil
- ☐Feeders
- ☐Filters, Air
- ☐Filters, Oil
- ☐Fire Brick
- ☐Flanges, Pipe
- ☐Frogs and Switches
- ☐Fuses, Blasting
- ☐Gears
- ☐Goggles
- ☐Governors
- ☐Grinding Balls
- ☐Grizzlies
- ☐Guns, Hydraulic
- ☐Hoists, Air
- ☐Hoists, Derrick
- ☐Hoists, Drum
- ☐Hoists, Motor Truck Body
- ☐Hoists, Skip
- ☐Hose, Air Steam, Water
- ☐Hose, Sand Suction
- ☐Hydrators
- ☐Kettles, Calcining
- ☐Kilns, Rotary
- ☐Kilns, Vertical
- ☐Linings, Kiln
- ☐Loaders, Portable
- ☐Loaders and Unloaders, Box Car
- ☐Locomotives, Diesel
- ☐Locomotives, Gasoline
- ☐Locomotives, Steam
- ☐Log Washers
- ☐Measuring Devices
- ☐Mills, Compartment
- ☐Mills, Tube
- ☐Mixers, Plaster
- ☐Motors, Electric
- ☐Motors, Gasoline
- ☐Motor Trucks, Ready Mixed Concrete
- ☐Nozzles, Hydraulic Mining
- ☐Nozzles, Gravel Washing
- ☐Nozzles, Spray
- ☐Nozzles, Dust Settling
- ☐Nozzles, Suction Hose
- ☐Nuggets, Grinding Perforated Metal
- ☐Poidometers
- ☐Pulleys, Clutch
- ☐Pulleys, Magnetic
- ☐Pulverized Fuel Systems
- ☐Pulverizers, Ball, Conical, Pebble
- ☐Pulverizers, Disc
- ☐Pulverizers, Hammer
- ☐Pulverizers, Ring
- ☐Pulverizers, Rod
- ☐Pulverizers, Roll
- ☐Pumps, Centrifugal
- ☐Pumps, Deep Well
- ☐Pumps, Sand and Gravel
- ☐Pumps, Slurry
- ☐Pumps, Steam
- ☐Radiators, Engine Cooling
- ☐Rails
- ☐Refractories
- ☐Respirators
- ☐Rollers, Conveyor
- ☐Rolls, Crushing
- ☐Rope, Wire
- ☐Safety Appliances
- ☐Sand-Lime-Brick Machinery
- ☐Scales, Track
- ☐Scales, Truck
- ☐Scrapers, Dragline
- ☐Screens, Revolving
- ☐Screens, Shaking
- ☐Screens, Vibrating
- ☐Separators, Air
- ☐Separators, Dry Centrifugal
- ☐Separators, Magnetic
- ☐Shovels, Gasoline
- ☐Shovels, Steam
- ☐Skips
- ☐Sleeves, Dredge
- ☐Slugs and Nuggets, Grinding
- ☐Speed Reducers and Gears
- ☐Spray Nozzles
- ☐Sprays, Paint
- ☐Sprockets
- ☐Steel, Tool
- ☐Stokers
- ☐Switches, Track
- ☐Tanks, Concrete and Steel
- ☐Tanks, Sand Settling
- ☐Tanks, Wood
- ☐Thickeners, Slurry
- ☐Track, Portable
- ☐Track Shifters
- ☐Tractors, Crawler
- ☐Tramways, Aerial
- ☐Trippers, Belt
- ☐Trippers, Tramway
- ☐Unloaders
- ☐Valves, Pump
- ☐Washers and Scrubbers, Sand, Gravel, Stone
- ☐Weighters, Automatic
- ☐Welding Supplies
- ☐Wheels, Car
- ☐Winches
- ☐Wire Cloth
- ☐Wire Cloth, Manganese Steel

To be used for.....

Firm Name..... *Individual* .....

Address..... *City*..... *State*.....

PLAINVILLE (cont.)

Product and Annual Capacity: Crushed trap rock 300,000 tons.

Stripping: Type B Erie shovel and trucks. Drilling and Blasting: 2 No. 50 BE Armstrong well drills, 2 X-71 Ingersoll-Rand drills, 6 Ingersoll-Rand hammer drills. Digging and Loading: 2 No. 37 Marion electric shovels. Delivery to Plant: 4 Mack trucks, Easton Won-Way bodies. Primary Crushing: 42-in. by 54-in. Buchanan jaw crusher. Secondary Crushing: 5½-ft. Symons cone crusher. Sizing: 6 revolving screens.

***Sherman Sand & Stone Co.** **CrTrR**

Branch of New Britain, Conn.

Plant Executive: F. C. Stocks (New Britain, Conn.), gen. mgr., supt., specifies equipment.

Product and Annual Capacity: Crushed stone 70,000 tons.

Stripping: Erie steam shovel. Drilling: 2 tripod drills. Digging and Loading: Erie steam shovel. Delivery to Plant: Truck. Primary Crushing: 16-in. McCully crusher. First Sizing: 60-in. by 10-ft. revolving screen. Secondary Crushing: 6-in. McCully fine reduction crusher, No. 4 McCully crusher. Second Sizing: 60-in. by 20-ft. revolving screen. Storing: 700-ton wood bins. Shipping: Trucks.

Vulcan Sand & Stone Co., Inc. **SG**

Plant Executive: A. J. Martin, gen. mgr., pur. agt., specifies equipment.

Products and Annual Capacity: Sand and gravel 50,000 tons.

Nature of Deposit: Bank. Stripping: Skimmer. Digging, Loading and Delivery to Plant: Electric dragline. First Screening: Telsmith revolving screens. Washing: Telsmith screen, settling tanks. Storing and Packing: Crane. Shipping: Trucks, railroad.

REDDING Fairfield

Redding Marble Co. **CrM**

Branch of Ne[illegible] Conn.

Products: [illegible] white marble and agstone.

GEOGRAPHICAL

ROCKYHILL Hartford

Connecticut Quarries Co., Inc. **CrTrR**

Branch of New Haven, Conn.

Plant Executives: W. F. Quinn, supt.; F. Tolli, eng.; F. H. Edwards (Meriden, Conn.), gen. supt., specifies equipment.

Product and Annual Capacity: Crushed trap rock 125,000 tons.

Stripping: Type B Erie shovel and teams. Drilling and Blasting: 2 Ingersoll-Rand hammer drills, 2 X71 Ingersoll-Rand drills. Digging and Loading: 2 Type B Erie shovels. Delivery to Plant: Mack truck, International truck. Primary Crushing: 30-in. by 42-in. Buchanan jaw crusher. Secondary Crushing: No. 7½ Allis-Chalmers McCully gyratory crushers, 2 No. 5 Allis-Chalmers, McCully gyratory crushers. Sizing: 2 revolving screens, Niagara vibrating screen.

SEYMOUR New Haven

Seymour Sand & Stone Co. **CrG-SG**

TARIFFVILLE Hartford

Balf Co., Edward **CrTrR**

Branch of Hartford, Conn. Member of Natl. Crushed Stone Assn.

For detailed information see Farmington, Conn., plant.

TORRINGTON Litchfield

Iffland Lumber Co., John C. **RmCon**

S. Main St.

Plant Executives: Earl E. Iffland, supt., eng., and Arthur B. Iffland, gen. mgr., specify equipment.

Products and Annual Capacity: Transit-mixed concrete 3,000 cu. yd.

Handling to Plant: Aggregates by gravity; cement by hand. Mixing and Delivery to Job: Agitator trucks

Iffland Lumber Co., John C. **SG**

2 plants. Formerly Frank W. Fuller.

Product and Annual Capacity: Aggregates 40,000 tons.

Digging and Loading: Power shovels and draglines. Delivery to Plant: Conveyors. Sizing: Wet screening and washing.

**Send mail to main offi[illegible]*

No Directory has ever been as complete or accurate as the 1932 edition—

More listings—more information—main offices included with plant listings in the geographical section—

Absolutely up-to-the-minute

Included in Pit & Quarry Handbook, or separately bound with heavy cover—$5.00 per copy

Pit & Quarry Publications
538 S. Clark St.,
Chicago, Ill.

Place), sec.; John Jugler (White St. Extension), supt.

Plant: Danbury, Conn.

Connecticut Quarries Co., Inc. **CrTrR**
67 Church St., New Haven, Conn.

T. R. Blakeslee, pres.; A. L. Worthen, v.-pres, gen. mgr.; H. L. Blakeslee, sec.; R. J. Reigeluth, tr.; F. H. Edwards (Meriden, Conn.), gen. supt.

Plants (8): Cheshire, Conn.; Granby, Conn.; Meriden, Conn.; Mt. Carmel, Conn.; New Britain, Conn.; Plainville, Conn.; Rockyhill, Conn.; Wallingford, Conn.

Connellsville Bluestone Co. **CrSt**
305 W. Crawford, Connellsville, Pa.

Fred S. Opperman, pres., gen. mgr.; John T. Wurtz, tr.

Plant: Connellsville, Pa.

Connersville Gravel Co., Inc.
Connersville, Ind. **ConPr-CrG-SG**

Fred Neuman (Connersville), pres.; O. A. Kirkham (Lewisville, Ind.), v.-pres.; Clyde Piper (Connersville), sec.-tr., gen. mgr.

Plant: Connersville, Ind.

Consolidated Cement Corp. **PC**
111 W. Monroe St., Chicago, Ill.

Managed and operated by Cowham Engineering Co., Chicago, Ill.

John L. Senior, pres.; S. W. Storey, v.-pres.; Howard Miller, sec.-tr.; J. H. Greene, pur. agt.; J. E. Curtis, gen. supt.

Plants (3): Fredonia, Kan.; Mildred, Kan.; Cement City, Mich.

Consolidated Feldspar Corp. **CrF**
1403 Trenton Trust Bldg., Trenton, N. J.

H. P. Margerum (Trenton, N. J.), pres.; N. C. Smith (Brunswick, Me.), v.-pres.; M. A. Murray (Trenton, N. J.), sec.-tr.; R. W. Lawson (Erwin, Tenn.), gen. mgr.; V. V. Kelsey (Trenton, N. J.), sales mgr.; A. Ackerman (Spruce Pine, N. C.), pur. agt.; H. A. Womack (Spruce Pine, N. C.), ch. eng.

Plants (9): Kingman, Ariz.; Topsham, Me.; Trenton, N. J. (G[illegible]g Sons Co.); Bedford, N. Y.; Ro[illegible] Y.; Spruce Pine, N. C. (G[illegible]s Co.); East Liverpool, O. [illegible] Sons Co.); Keystone, S. [illegible]in, Tenn. (Erwin Feldspa[illegible]).

ALPHABETICAL

Consolid[illegible] Quarries Corp. **CrGran**
Bona A[illegible]h Bldg., Atlanta, Ga.

A. Fillmore Hyde (381 Fourth Ave., New York, N. Y.), pres.; R. H. Cobb (Atlanta), v.-pres.; A. G. Loomis (Atlanta), tr.; G. A. Austin (Atlanta), gen. mgr.; Nelson Severinghaus (Lithonia, Ga.), supt.

Plant: Lithonia, Ga.

Consolidated Rock Products Co. **CrG-SG**
656 S. Los Angeles St., Los Angeles, Cal. (Main Office); Azusa, Cal. (Eastern Div. Office); 6514 Landershim Blvd., North Hollywood, Cal. (Western Div. Office).

F. J. Twaits, pres., gen. mgr.; Frank W. Clark, v.-pres.; Robert Mitchell, sec.; Carl H. Wittenberg, tr.; L. L. Rogers, gen. prod. mgr.; G. H. Moore, supt. Eastern Div.; R. C. Griffin, supt. Western Div.

Plants (17): Azusa, Cal. (5); Baldwin Park, Cal. (2); Claremont, Cal.; Irwindale, Cal.; Los Angeles, Cal.; North Hollywood, Cal. (6); Orange, Cal.

Consolidated Rock Products Co. **CrLs**
Lakeland, Fla.

William P. McDonald (381 Fourth Ave., New York, N. Y.), pres.; Charles A. Taylor (381 Fourth Ave., New York, N. Y.), v.-pres.; Richard E. Fitzgerald (106 S. Tennessee Ave., Lakeland, Fla.), sec.-tr.

Plant: Brooksville, Fla.

Consolidated Sand & Gravel, Ltd. **SG**
402 Harbor Bldg., Toronto, Ont.

John E. Russell, pres.; J. F. M. Stewart (Royal Bank Bldg.), v.-pres.; A. M. Harnwell, sec.-tr.; G. G. Robinson, gen. mgr.; A. G. Bennett, pur. agt., gen. supt.

Plants (4): Durham, Ont.; Fuller (no P. O.), Ont.; Paris, Ont.; Waterford, Ont.

Consolidated Sand & Stone Co. **CrG-CrQ-SG**
204 Boyce Greeley Bldg., Sioux Falls, S. D.

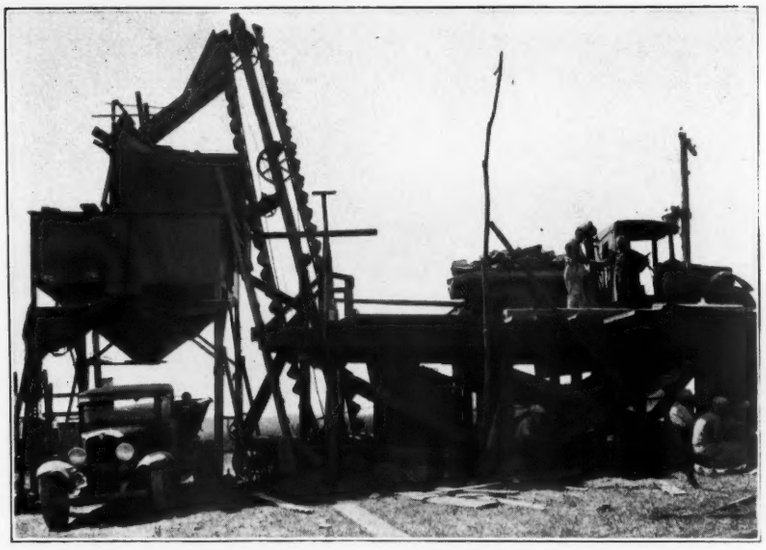
William Hoese (Mitchell, S. D.), pres.; W. A. Barnhart (Salem, S. D.), v.-pres.; Delbert Wheeler (Sioux Falls), sec.-tr., gen. mgr., pur. agt.

Plants (2): Spencer, S. D.; Wheeler Spur (P. O. Sioux Falls), S. D.

Index to Advertisers

Allen Cone and Machinery Corp. 73
*Allen Sherman Hoff Co. 16
*American Steel and Wire Co. 7
Amtorg Publishing Division..... 70
Austin-Western Road Machinery Co. 5
Birmingham Rail & Locomotive Co. 76
Bradley Pulverizer Co. 71
Broadcast Section.....76–78
Burnham, Royal E. 78
Chicago Perforating Co. 72
Consolidated Products Co. 76
Cross Engineering Co. 73
*Deister Concentration Co. 73
*Deister Machine Co. 71
Edelblute Co., T. H. 74
*Ensign-Bickford Co. 15
Equipment Corporation of America..... 77
Gay, Rubert M. 74
Georgia Iron Works..... 74
Goodyear Tire & Rubber Co. 3
*Gruendler Crusher and Pulverizer Co. .....
.....Inside Back Cover
Haiss Mfg. Co., Geo. 70
*Hercules Powder Co. 75
Hotel Henry 74
*Hyman-Michaels Co. 76
*Kennedy-Van Saun Mfg. & Engr. Corp. 69
*Leschen and Sons Rope Co., A...Inside Back Cover
Lewistown Foundry and Machine Co. 72
Lexington Hotel..... 72
Lima Excavator Sales Agency..... 77
Loomis Machine Co. 74
Mayer, F. 76
*McLanahan and Stone Corp. 73
*Morris Machine Works..... 75
Morrow Mfg. Co. 75
National Crushed Stone Association.....4–14
National Ready Mixed Concrete Association...4–14
National Sand and Gravel Association.....4–14
National Wire Cloth Co. 74
New York Belting and Packing Co. 1
*Nordberg Mfg. Co. 13
O'Neill Co., A. J. 76
Pennsylvania Drilling Co. 78
Pulmosan Safety Equipment Corp. 9
*Roebling's Sons Co., John A. ....Inside Front Cover
Ryerson & Son, Inc., Joseph T. 78
*Sauerman Bros., Inc. 75
Simplicity System Co. 74
Smith Engineering Works.....Back Cover
Sprague & Henwood, Inc. 78
*Traylor Engineering and Mfg. Co. 70
Universal Road Machinery Co. 70–74
Welch Engineering Service, F. M. 72
Williamsport Wire Rope Co. 11

***See also information in the 1932 Pit and Quarry HANDBOOK**



Gruendler Crushing Plant installation Langley Brothers, Emporia, Kansas—350 tons per day.

Secret to Greater Profits---Quarries and Gravel Pits

New Developments in Hammer Principle with Patented Features by Gruendler makes this new development in crusher equipment the greatest advancement in modern stone crushing plants, crushing 3 in. and under and adjustable to ½ in. and under on one crusher, arranged in sizes from 25 to 300 tons hourly, with greater ratio of reduction. Handles Limestone, trap rock, iron ore, gravel, granite, slate, etc., with greater profit to the operator.

The experienced quarrymen will immediately recognize the simplicity and soundness of this principle.

Installation of Langley Bros. Quarry shows Gruendler heavy duty Hammer Crusher, continuous Bucket Elevator, all steel telescope bins and shaker screen doing a big job of crushing with small investment.

Install a new plant of Gruendler design beside your present one and make comparisons. Obtain more uniform aggregate at less cost per ton crushing and lower operating cost. Gruendler also manufactures roller bearing fine reduction jaw crushers, steel bins, continuous elevators, conveyors, pan conveyor, feeders, bin gates, shaker and revolving screens, complete equipment for any size plant.

When writing state the nature of material, capacity in tons or yards per hour and size finished aggregate you wish to supply.

GRUENDLER CRUSHER & PULVERIZER CO.

2915-2917 N. Market Street — **St. Louis, Missouri**

Measure Its Value by the Yardstick of Results

THE quality of "HERCULES" *(Red-Strand)* Wire Rope is not a matter of chance but the result of definite and specific causes. In the first place it is made of acid open-hearth steel wire; next, each wire used is rigidly tested by us to make sure that it meets our exacting standards, which are the result of our long experience in wire rope making.

But after all, results are what count and this is the yardstick we would like to have you use in determining the actual worth of this wire rope. Do not hesitate to try it on your hardest work.

In order to be suitable for any and all working conditions, "HERCULES" *(Red-Strand)* Wire Rope is made in a wide range of constructions including numerous designs in both Round Strand and Patent Flattened Strand types. If you will tell us how you use wire rope, we shall be glad to suggest the construction we consider best for your equipment. *Please feel free to write us for catalogs and further particulars.*

Made Only by **A. Leschen & Sons Rope Company** Established 1857

5909 KENNERLY AVENUE

ST. LOUIS, MO.

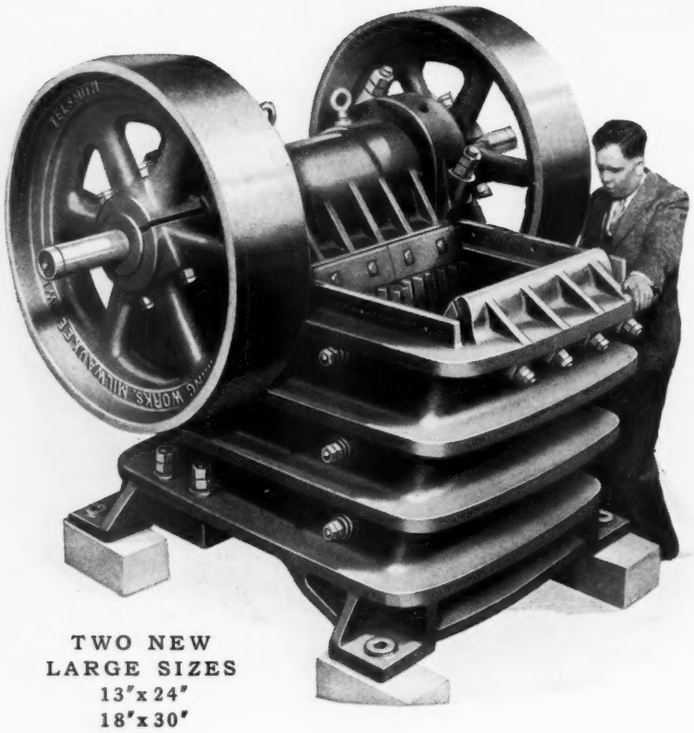
New York .....90 West Street
Chicago.....810 W. Washington Blvd.
Denver.....1554 Wazee Street
San Francisco.....520 Fourth Street

CAPACITY

FOR HEAVY CRUSHING

GREATER EFFICIENCY IN

FINE REDUCTION



TWO NEW
LARGE SIZES
13″x 24″
18″x 30″

One crusher—in one process—now gives you both coarse and secondary crushing. And the product is cubical and uniform, with few slabs—little dust. • Of course, it's a Telsmith—a super-strong, all-steel jaw crusher of the force-feed type . . . simply and compactly designed . . . with a peculiar crushing action. • The upper part of the swinging jaw moves outward to crush coarse rock at the top . . . then retreats . . . and lower part of jaw moves forward to finish crushing action at the bottom. Three toggle settings give greater reduction at coarse or fine adjustment. • The Telsmith-Wheeling has a massive frame and swinging jaw, both annealed cast steel, and its jaw dies are manganese steel. • Cylindrical roller bearings, in both swinging jaw and frame, are ideal for heavy crushing—permit higher crushing speeds—eliminate bearing troubles. They need no adjusting . . . allow quick dismantling and reassembly in the field, even by inexperienced labor. • Six sizes to meet every need. Write for Bulletin W15.

SMITH ENGINEERING WORKS
504 East Capitol Drive
MILWAUKEE WISCONSIN

Canadian Representatives:
Canadian Ingersoll-Rand Co. Ltd., Montreal, P. Q.

140th St. & East River New York City	211 W. Wacker Drive Chicago, Ill.	Harrison Bldg. Philadelphia, Pa.
1109 Statler Bldg. Boston, Mass.	Clark & Freeland, Inc. Baltimore, Md.	607 Westinghouse Bldg. Pittsburgh, Penn.
928 Williamson Bldg. Cleveland, Ohio	1896 N. High St. Columbus, Ohio	Borchert-Ingersoll, Inc. St. Paul, Minn.
Brandeis M & S Co. Louisville, Ky.	Graham B. Bright Richmond, Va.	Choctaw C. & M. Co. Memphis, Tenn.

W-7

TELSMITH WHEELING JAW CRUSHERS